Karlsruher Institut für Technologie

Module Handbook
Mechanical Engineering Bachelor (2016)

SPO 2016, for study beginners from winter term 2018/2019

Summer Term 2019

Date: 01.04.2019

KIT DEPARTMENT OF MECHANICAL ENGINEERING

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1.1 Orientation Exam

Mandatory		
M-MACH-104624	Orientation Exam	0 CR

1.2 Bachelor Thesis

Credits
15

Mandatory		
M-MACH-104494	Bachelor Thesis	15 CR

1.3 Fundamentals of Engineering

Credits
143

Mandatory		
M-MATH-102859	Advanced Mathematics	21 CR
M-MACH-102572	Engineering Mechanics	23 CR
M-MACH-102562	Materials Science	14 CR
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M-MACH-102564	Measurement and Control Systems	7 CR
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M-MACH-102566	Machines and Processes	7 CR
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M-MACH-100297	Production Operations Management	5 CR

1.4 Specialization in Mechanical Engineering

Credits
16

Election block: Schwerpunkt (1 item)		
M-MACH-102812	Major Field: Powertrain Systems	12 CR
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M-MACH-102815	Major Field: Engineering Design	12 CR
M-MACH-102582	Major Field: Continuum Mechanics	12 CR
M-MACH-102816	Major Field: Fundamentals of Energy Technology	12 CR
M-MACH-102583	Major Field: Information Management	12 CR
M-MACH-102817	Major Field: Information Technology	12 CR
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M-MACH-102644	Major Field: Production Engineering	12 CR
M-MACH-102589	Major Field: Production Systems	12 CR
M-MACH-104442	Major Field: Vibration Theory	12 CR
M-MACH-102645	Major Field: Combustion Engine Techniques	12 CR
M-MACH-102821	Major Field: Technical Logistics	12 CR
Mandatory		
M-MACH-102746	Compulsory Elective Module	4 CR

1.5 Interdisciplinary Qualifications

Credits
6

Mandatory		
M-MACH-102576	Key Competences	6 CR

2 Modules

M 2.1 Module: Advanced Mathematics [M-MATH-102859]

Responsible: Prof. Dr. Roland Griesmaier
Organisation: KIT Department of Mathematics
Part of: Fundamentals of Engineering

Credits	Recurrence	Language	Level	Version
21	Annual	Deutsch	3	1

Mandatory			
T-MATH-100525	Tutorial Advanced Mathematics I	0 CR	Arens, Griesmaier, Hettlich
T-MATH-100526	Tutorial Advanced Mathematics II	0 CR	Arens, Griesmaier, Hettlich
T-MATH-100527	Tutorial Advanced Mathematics III	0 CR	Arens, Griesmaier, Hettlich
T-MATH-100275	Advanced Mathematics I	7 CR	Arens, Griesmaier, Hettlich
T-MATH-100276	Advanced Mathematics II	7 CR	Arens, Griesmaier, Hettlich
T-MATH-100277	Advanced Mathematics III	7 CR	Arens, Griesmaier, Hettlich

Competence Certificate
Learning assessment is carried by three written examinations of length 120 minutes each and by three sets of homework assignments (pre-requesites). A "pass" result on a pre-requesites in Advanced Mathematics I, II and III, respectively, is a requirement for registration for the corresponding written examination.

Competence Goal
The students know the fundamentals of one-dimensional calculus. They can reliably use limits, functions, power series and integrals. They understand central concepts such as continuity, differentiability or integrability and they know important statements about these concepts. The students can follow the arguments leading to these statements as presented in the lectures and are able to independently prove simple assertions based on these statements.

The students know about the fundamentals of linear algebra. The are able to use vectors, linear maps and matrices without problems. They have basic knowledge about Fourier series. The students also can theoretically and practically deal with initial value problems of ordinary differential equations. They can make use of classical solution techniques for linear differential equations.

The students know about differential calculus for vector-valued functions of several variables and about techniques of vector calculus such as the definition and application of differential operators, the computation of domain, line and surface integrals and important integral theorems. They have basic knowledge about partial differential equations and know basic facts from stochastics.

Prerequisites
None.

Content
Fundamentals, sequences and convergence, functions and continuity, series, differential calculus of one real variable, integral calculus, vector spaces, linear maps, eigenvalues, Fourier series, differential equations, Laplace transform, multidimensional calculus, domain integrals, vector calculus, partial differential equations, stochastics

Workload
In class: 270 hours

- lectures, tutorials and examinations

Independent study: 360 hours

- independent review of course material
- work on homework assignments
- preparation for written exams

Learning type
Lecture, problem classes, tutorials

M 2.2 Module: Bachelor Thesis [M-MACH-104494]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Organisation: KIT Department of Mechanical Engineering
Part of: Bachelor Thesis

Credits	Language	Level	Version
15	Deutsch	3	1

Mandatory			
T-MACH-109188	Bachelor Thesis	12 CR	Heilmaier
T-MACH-109189	Presentation	3 CR	Heilmaier

Competence Certificate
The module Bachelor Thesis consists of a written bachelor thesis and an oral presentation of a scientific subject chosen by the student himself/herself or given by the supervisor. The bachelor thesis is designed to show that the student is able to deal with a problem of his/her subject area in an independent manner and within the given period of time using scientific methods.
The work load of the bachelor thesis corresponds to 12 ECTS. The maximal processing time of the bachelor thesis takes three months.
The date of issue of the subject has to be fixed by the supervisor and the student and to be put on record at the examination board. The subject of the bachelor thesis may be only returned once and only within the first month of processing time.
On a reasoned request of the student, the examination board can extend the processing time by up to one month. If the bachelor thesis is not completed in time, this examination is "failed" (5,0), unless the student is not responsible.
The bachelor thesis is to be evaluated by not less than a professor or a senior scientist according to § 14 Abs. 3 Ziff. 1 KITG and another examiner. Generally, one of the two examiners is the person who has assigned the thesis. If the examiners do not agree, the bachelor thesis is graded by the examination board within this assessment; another expert can be appointed too. The bachelor thesis has to be graded within a period of six weeks after the submission.
The colloquium presentation must be held within 6 weeks after the submission of the bachelor thesis. The presentation should last around 20 minutes, corresponds to 3 ECTS, and is followed by a scientific discussion with the present expert audience.

Competence Goal
The student is able to work independently on a defined, subject-relevant theme based on scientific criteria within a given period of time. The student is able to do research, to analyze information, to abstract as well as collect and recognize basic principles and regularities on the basis of less structured information. He/she overviews a question, is able to choose scientific methods and techniques, and use them to solve the question or to identify other potentials. In general, this will be carried out in consideration of social and/or ethical aspects.

The student can interpret, evaluate, and if needed plot the results obtained. He/she is able to clearly structure a scientific work and (a) to communicate it in written form using technical terminology as well as (b) to present it in oral form and discuss it with experts.

Prerequisites
The requirement for admission to the bachelor thesis module are 120 ECTS. As to exceptions, the examination board decides on a request of the student (see § 14 (1) SPO).

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to earn at least 120 credits in the following fields:
    - Fundamentals of Engineering
    - Interdisciplinary Qualifications
    - Specialization in Mechanical Engineering

Content
The student shall be allowed to make suggestions for the topic of his/her bachelor thesis. The topic is set by the supervisor of the thesis in accordance with § 14 (3) SPO.

Workload
The workload for the preparation and presentation of the bachelor thesis is about 450 hours.

M 2.3 Module: Compulsory Elective Module (BSc-Modul WPF) [M-MACH-102746]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (mandatory)

Credits	Language	Level	Version
4	Deutsch	3	1

Election block: Wahlpflichtmodul (1 item)			
T-MACH-105381	Virtual Engineering (Specific Topics)	4 CR	Ovtcharova
T-MACH-105212	CAE-Workshop	4 CR	Albers
T-MACH-100535	Introduction into Mechatronics	6 CR	Böhland, Lorch, Reischl
T-MACH-105209	Introduction into the Multi-Body Dynamics	5 CR	Seemann
T-MACH-102093	Fluid Power Systems	4 CR	Geimer, Pult
T-MACH-102163	Basics of Technical Logistics	6 CR	Mittwollen, Oellerich
T-MACH-105213	Fundamentals of Combustion I	4 CR	Maas, Sommerer
T-MACH-105210	Machine Dynamics	5 CR	Proppe
T-MACH-105452	Mathématiques appliquées aux sciences de l'ingénieur	5 CR	Dantan
T-MACH-105293	Mathematical Methods in Dynamics	5 CR	Proppe
T-MACH-100297	Mathematical Methods in Strength of Materials	5 CR	Böhlke
T-MACH-105294	Mathematical Methods of Vibration Theory	5 CR	Seemann
T-MACH-105295	Mathematical Methods in Fluid Mechanics	6 CR	Frohnapfel
T-MACH-105303	Modelling of Microstructures	5 CR	August, Nestler
T-MACH-100300	Modelling and Simulation	5 CR	Gumbsch, Nestler
T-MACH-100530	Physics for Engineers	5 CR	Dienwiebel, Gumbsch, Nesterov-Müller, Weygand
T-MACH-102102	Physical Basics of Laser Technology	5 CR	Schneider
T-MACH-105147	Product Lifecycle Management	4 CR	Ovtcharova
T-MACH-100531	Systematic Materials Selection	4 CR	Dietrich
T-MACH-105652	Fundamentals of Combustion Engine Technology	5 CR	Bernhardt, Kubach, Pfeil, Toedter, Wagner
T-MACH-102083	Integrated Information Systems for Engineers	4 CR	Ovtcharova
T-MACH-105290	Vibration Theory	5 CR	Fidlin
T-MACH-105292	Heat and Mass Transfer	4 CR	Bockhorn, Maas
T-MACH-100532	Scientific Computing for Engineers	5 CR	Gumbsch, Weygand
Election block: Wahlpflichtmodul (Ü) ()			
T-MACH-106830	Tutorial Mathematical Methods in Strength of Materials	0 CR	Böhlke

Competence Certificate
oral/written exam

Competence Goal
The elective course serves as a comprehensive, in-depth analysis of fundamentals in selected areas of mechanical engineering. The specific learning outcomes are defined by the respective coordinator of the course.

Prerequisites
None

Annotation
Compulsory elective subjects have to be chosen from the corresponding catalogues as displayed in the bachelor´s program with an amount of 4 credit points (see Studienplan or Module Handbook)

Workload
The work load is about 120 hours, corresponding to 4 credit points.The work load varies from lecture to lecture, for example a lecture consisting of 4 credit points includes 28 h of presence during the lecture and 92 h preparation and rework time at home, 120 hours in total.

Learning type
Lectures, Tutorials

M 2.4 Module: Computer Science (BSc-Modul 09, Inf) [M-MACH-102563]

Responsible: Prof. Dr.-Ing. Jivka Ovtcharova
Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Duration	Language	Level	Version
6	2 term	Deutsch/Englisch	3	2

Mandatory			
T-MACH-105205	Computer Science for Engineers	6 CR	Ovtcharova
T-MACH-105206	Computer Science for Engineers	0 CR	Ovtcharova

Competence Certificate
Written examination "Computer Science for Engineers", 100%, 180 minutes; Examination prerequisite: passed lap course.

Competence Goal
Students can identify and explain fundamental terms, problems and concepts of computer science. They can apply the basic methods of the OO modeling with UML and implement the object-oriented programming (OOP) with the programming language JAVA.

Module grade calculation
Examination result "Computer Science for Engineers" 100%

Prerequisites
None

Content
Basics: Information representation- and processing, terms and definitions: alphabet, data, signals, information, numeral systems, propositional logic and Boolean algebra, computer architectures, programming paradigms.
Object Orientation: Definition and important characteristics of object orientation, Object-oriented modeling with UML.
Data Structures: Definition, properties and application of graphs, trees, linked lists, queues and stacks.
Algorithms: Characteristics of algorithms, complexity analysis, design methods, important examples.
Database management systems: Relational data model, relational algebra, declarative language SQL. Basics and concepts of JAVA. Introduction to programming using JAVA.

Annotation
For the Bachelor's program Mechanical Engineering the module (including all brick details, exams and courses) is offered in German.

For the Bachelor's program Mechanical Engineering (International) the module (including all brick details, exams and courses) is offered in English.

Workload
Attendance time: 63 hours

Self-study: 117 hours

Learning type
Lecture and Lab Course

M 2.5 Module: Electrical Engineering [M-ETIT-104049]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Fundamentals of Engineering (Usage until 3/7/2019)

Credits	Language	Level	Version
8	Englisch	3	1

Mandatory			
T-ETIT-108386	Electrical Engineering and Electronics	8 CR	Becker

Competence Certificate
Written exam, duration 3 hours.

Prerequisites
none

Annotation
Exam and Lecture will be held in English.

M 2.6 Module: Electrical Engineering [M-ETIT-104801]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Fundamentals of Engineering (Usage from 3/8/2019)

Credits	Language	Level	Version
8	Deutsch	3	1

Mandatory			
T-ETIT-109820	Electrical Engineering and Electronics	8 CR	Becker

M 2.7 Module: Engineering Mechanics (BSc-Modul 03, TM) [M-MACH-102572]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Prof. Dr.-Ing. Wolfgang Seemann

Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Duration	Language	Level	Version
23	4 term	Deutsch/Englisch	3	1

Mandatory			
T-MACH-100282	Engineering Mechanics I	7 CR	Böhlke, Langhoff
T-MACH-100283	Engineering Mechanics II	6 CR	Böhlke, Langhoff
T-MACH-105201	Engineering Mechanics III & IV	10 CR	Seemann
T-MACH-100528	Tutorial Engineering Mechanics I	0 CR	Böhlke, Langhoff
T-MACH-100284	Tutorial Engineering Mechanics II	0 CR	Böhlke, Langhoff
T-MACH-105202	Tutorial Engineering Mechanics III	0 CR	Seemann
T-MACH-105203	Tutorial Engineering Mechanics IV	0 CR	Seemann

Competence Certificate
prerequisites EM I, II (see T-MACH-100528 "Engineering Mechanics I (Tutorial)" as well as T-MACH-100284 "Engineering Mechanics II (Tutorial)"): they consist of solving problems of the work sheets in four categories: written mandatory homework, written homework, computational homework, colloquia.

prerequisites EM III, IV

"Engineering Mechanics I", written exam, 90 minutes; graded:
"Engineering Mechanics II", written exam, 90 minutes; graded;
"Engineering Mechanics III/IV", written exam, 180 Minutes; graded;

The final grade of this module is computed as ECTS-based weighted sum of the included exams.

Competence Goal
After having finished the lectures EM I and EM II the students can

- assess stress and strain distributions for the basic load cases within the framework of elasticity and thermoelasticity
- compute and evaluate 3D stress and strain states
- apply the principle of virtual displacements
- apply energy methods and evaluate approximate solutions
- evaluate the stability of equilibrium positions
- solve worksheet problems to topics of the lecture using the computer algebra system MAPLE

In EM III and EM IV the students learn to analyse the motion of points and systems. Based on the axioms of Newton and Euler they know how to derive equations of motion. Besides the synthetic methods they get familiar with analytical methods which are based on energy expressions and can be applied efficiently and formalised. These methods are introduced in the scope of systems of mechanical engineering so that students can determine and analyse motions and the forces which are generated by these motions.

Prerequisites
None

Content
This Module consists of the courses "Engineering Mechanics I (lecture)" up to "Engineering Mechanics IV (lecture)" as well as "Engineering Mechanics I (Tutorial)" up to "Engineering Mechanics IV (Tutorial)"

Contents of "Engineering Mechanics I": basics of vector calculus; force systems; statics of rigid bodies; internal forces and moments in bars and beams; friction; centre of gravity, centre of mass; work, energy, principle of virtual work; statics of inextensible ropes; elastostatics of tension-compression-bars

Contents of "Engineering Mechanics II": bending; shear; torsion; stress and strain state in 3D; Hooke's law in 3D; elasticity theors in 3D; energy methods in elastostatics; approximation methods; stability

Contents of "Engineering Mechanics III":

Kinematics: Cartesian, cylindrical and natural coordinates. Time derivatives in moving reference frames, angular velocities of reference frames.

Kinetics of a particle:
Newton's axiom, Principle of d'Alembert, work of a force, kinetic and potential energies, principle of linear momentum, principle of moment of momentum, kinetics in moving reference systems

Systems of particles:
Principle of center of mass, Principle of moment of momentum, impacts between particles, systems with variable mass, applications.

Plain motion of rigid bodies:
Pure translation, pure rotation, general plain motion. Instantaneous center of rotation, Kinetics, moment of momentum, principle of work and principle of energy conservation for a rotation around a space-fixed axis. Mass moment of inertia, parallel-axis-theorem.Principle of linear momentum and principle of moment of momentum for arbitrary plain motion. Principle of d'Alembert for plain motion. Principles of linear and moment of momentum in integral form. Applications for impact problems.

Contents of "Engineering Mechanics IV":

Spatial kinematics of a rigid body, Euler angles, angular velocity using Euler angles, Euler's equations, inertia tensor, kinetic energy of a rigid body, free gyroscopes, forced gyroscopes, systems of rigid bodies, principle of d'Alembert, Lagrange's equations of the first and second kind, generalized coordinates, free and forced vibration of one degree of freedom systems, frequency response, vibration of multi degree of freedom systems, vibration absorption

Annotation
For the Bachelor’s program Mechanical Engineering the module (including all brick details, exams and courses) is offered in German.

For the Bachelor’s program Mechanical Engineering (International) the module (including all brick details, exams and courses) is offered in English.

Workload
lectures and exercises: 204h

homework and preparation of examination: 486h

Learning type
Lectures, Tutorials, Lab course groups, attestation of solved work sheets, colloquiua, consultation hours (optional)

M 2.8 Module: Fluid Mechanics (BSc-Modul 12, SL) [M-MACH-102565]

Responsible: Prof. Dr.-Ing. Bettina Frohnapfel
Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Duration	Language	Level	Version
8	2 term	Deutsch/Englisch	3	1

Mandatory			
T-MACH-105207	Fluid Mechanics 1&2	8 CR	Frohnapfel

Competence Certificate
Common examination of "Fluid Mechanics I" and "Fluid Mechanics II"; written exam, 3 hours (graded)

Competence Goal
After having completed this module the student is capable of deriving the mathematical equations that describe the motion of fluids and can determine flow quantities for generic problems. He/she can name characteristic properties of fluids and distinguish different flow states. The student is capable of determining fluid quantities in fundamental applications. This includes the calculation of

- static and dynamic forces acting from the fluid onto the solid
- two-dimensional viscous flows
- one-dimensional incompressible and compressible flows without losses
- lossy flows through pipes

Module grade calculation
result of exam

Prerequisites
none

Content
properties of fluids, surface tension, hydro- and aerostatics, kinematics, stream tube theory (compressible and incompressible), losses in pipeline systems, dimensional analysis, dimensionless numbers

tensor notation, fluid elements in continuum, Reynolds transport theorem, conservation of mass and momentum, continuity equation, constitutive law for Newtonian fluids, Navier-Stokes equations, angular momentum and energy conservation, integral form of the conservation equations, forces between fluids and solids, analytical solutions of the Navier-Stokes equations

Annotation
For the Bachelor's program Mechanical Engineering the module (including all brick details, exams and courses) is offered in German.

For the Bachelor's program Mechanical Engineering (International) the module (including all brick details, exams and courses) is offered in English.

Workload
regular attendance: 64 hoursself-study: 176 hours

Learning type
Lectures + tutorials

Literature
Zirep J., Bühler, K.: Grundzüge der Strömungslehre, Grundlagen, Statik und Dynamik der Fluide, Springer Vieweg

Kuhlmann, H.: Strömungsmechanik, Pearson Studium

Spurk, J.H.: Strömungslehre, Einführung in die Theorieder Strömungen, Springer-Verlag

Kundu, P.K., Cohen, K.M.: Fluid Mechanics, Elsevier 2008

M 2.9 Module: Key Competences (BSc-Modul 07, SQL) [M-MACH-102576]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Organisation: KIT Department of Mechanical Engineering

Part of: Interdisciplinary Qualifications

Credits	Recurrence	Duration	Level	Version
6	Once	2 term	3	1

Mandatory			
T-MACH-105296	Working Methods in Mechanical Engineering	4 CR	Deml
Election block: Schlüssselqualifikationen wählbare LV von HoC, ZAK (at least 2 credits)			
T-MACH-106375	Value stream within enterprises – The value chain at Bosch	2 CR	Maier

Competence Certificate
Success is monitored within the framework of academic achievements.

Amount, type and scope of the success control can vary according to the individually choice.

Competence Goal
After completing the module Key Competences students can

- determine and coordinate work steps, projects and goals, proceed systematically and purposefully, set priorities as well as assess the feasibility of a task,
- apply methods for the planning of a specific task under given framework conditions in a goal- and resource-oriented way,
- describe methods for scientific research and selection of technical information according to pre-established quality criteria and apply them to given problems,
- discuss empirical methods and apply them to selected examples,
- present technical information in a clear, readable, and convincingly argued manner in various forms of presentation (e.g. poster, exposé, abstract) in writing and appropriately visualize it graphically (e.g. engineering drawings, flowcharts),
- present and stand up for technical content in a convincing and appealing way,
- work as a team in a task-oriented manner, handle any conflicts on their own and take responsibility for themselves and others,
- communicate as a team in an objective, goal-oriented and interpersonal manner, represent their own interests, reflect and take into account the interests of others in their own words, and successfully organize the course of the conversation.

Module grade calculation
non graded

Prerequisites
none

Content
The module Key Competences consists "Working Methods in Mechanical Engineering" and a freely selectable courses offered by the KIT-House of Competence (HoC), the KIT Language Centre (SPZ) and the Centre for Cultural and General Studies (ZAK) with a work load corresponding to a total of 2 ECTS. Upon request, the examination board may approve further courses as freely selectable subjects in the module "Key Competences".

Annotation
Only HoC/SPZ/ZAK courses can be chosen.

Workload
The work load is about 180 hours, corresponding to 6 credit points in the Bachelor of Science program.

Learning type
The teaching and learning methods depend on the respectively chosen courses. The courses can be lectures, seminars, tutorials, or lab courses.

M 2.10 Module: Machines and Processes (mach13BSc-Modul 13, MuP) [M-MACH-102566]

Responsible: Dr.-Ing. Heiko Kubach
Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Duration	Language	Level	Version
7	1 term	Deutsch/Englisch	3	2

Mandatory			
T-MACH-105208	Machines and Processes	7 CR	Bauer, Kubach, Maas, Pritz
T-MACH-105232	Machines and Processes, Prerequisite	0 CR	Bauer, Kubach, Maas, Pritz

Competence Certificate
written exam (2 h)

Competence Goal
The students can name and describe basic energy conversion processes and energy converting machines. They can explain the application of these energy conversion processes in various machines. They can analyze and evaluate the processes and machines in terms of functionality and efficiency and they are able to solve basic technical problems in terms of operating the machines.

Module grade calculation
Grade out of written exam (100%)

Prerequisites
None.

Content

- Internal combsution engines
- Hydraulic fluid machinery
- Thermal turbo machines
- Thermodynamics

Annotation
For the Bachelor’s program Mechanical Engineering the module (including all brick details, exams and courses) is offered in German.

For the Bachelor’s program Mechanical Engineering (International) the module (including all brick details, exams and courses) is offered in English.

Workload
regular attendance: 48 h

self-study: 162 h

Learning type
Lecture+Tutorial

Lab Course

M 2.11 Module: Major Field: Combustion Engine Techniques (SP 57) [M-MACH-102645]

Responsible: Prof. Dr. Thomas Koch
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Language	Level	Version
12	Once	Deutsch	3	1

Mandatory			
T-MACH-105652	Fundamentals of Combustion Engine Technology	5 CR	Bernhardt, Kubach, Pfeil, Toedter, Wagner
Election block: Technik des Verbrennungsmotors (K) (at least 3 credits)			
T-MACH-105173	Analysis of Exhaust Gas and Lubricating Oil in Combustion Engines	4 CR	Gohl
T-MACH-105184	Fuels and Lubricants for Combustion Engines	4 CR	Kehrwald, Kubach
T-MACH-105169	Engine Measurement Techniques	4 CR	Bernhardt
Election block: Technik des Verbrennungsmotors (E) ()			
T-MACH-105655	Alternative Powertrain for Automobiles	4 CR	Noreikat
T-MACH-105451	Drive Systems and Possibilities to Increase Efficiency	2 CR	Kollmeier
T-MACH-105716	Numerical Methods for combustion process development	2 CR	Kubach, Waldenmaier
T-MACH-105044	Fundamentals of Catalytic Exhaust Gas Aftertreatment	4 CR	Deutschmann, Grunwaldt, Kubach, Lox
T-MACH-105985	Ignition systems	4 CR	Toedter
Election block: Technik des Verbrennungsmotors (P) (at most 4 credits)			
T-MACH-105337	Engine Laboratory	4 CR	Wagner

Competence Certificate
oral exam, written exam, lab course reports (see description of bricks)

Competence Goal
After completition of this „Schwerpunkt“ students are able to

- Describe and explain the working principal of different engine types
- Name the challenges in engine development
- Describe the correlations between engine operation, application parameters and emissions

Prerequisites
None

Content
The focus of this “Schwerpunkt” are the basic design and the working principle of internal combustion engines. Different types of engines such as gasoline engine, diesel engine and gas engine are subject. The fundamental thermodynamic aspects as well as the mechanical aspects are discussed. The influence of application parameters and the correlation of engine concepts, fuels and emissions are addressed.

Workload
The work load is 360 hours, corresponding to 12 credit points.

Learning type
Lectures, Exercises, Lab Courses

M 2.12 Module: Major Field: Continuum Mechanics (SP 13) [M-MACH-102582]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Language	Level	Version
12	Once	Deutsch/Englisch	3	2

Election notes
In the core area of each Major Field at least 8 ECTS have to be chosen.

Election block: Festigkeitslehre / Kontinuumsmechanik (K) (at least 8 credits)			
T-MACH-100296	Advanced Methods in Strength of Materials	5 CR	Böhlke
T-MACH-100297	Mathematical Methods in Strength of Materials	5 CR	Böhlke
Election block: Festigkeitslehre / Kontinuumsmechanik (E) (at most 6 credits)			
T-MACH-105212	CAE-Workshop	4 CR	Albers
T-MACH-105320	Introduction to the Finite Element Method	5 CR	Böhlke, Langhoff
T-MACH-105293	Mathematical Methods in Dynamics	5 CR	Proppe
T-MACH-105384	Computerized Multibody Dynamics	4 CR	Seemann
T-MACH-102140	Failure of Structural Materials: Deformation and Fracture	4 CR	Gumbsch, Weygand
T-MACH-109302	Computational Homogenization on Digital Image Data	6 CR	Schneider
Election block: Festigkeitslehre / Kontinuumsmechanik (Ü) ()			
T-MACH-106830	Tutorial Mathematical Methods in Strength of Materials	0 CR	Böhlke

Competence Goal
After having finished this major field the students can

- list mportant concepts and models of continuum mechanics
- analyse and evaluate models for describing the material behaviour
- apply these models in given problems

Prerequisites
None

Learning type
lectures, tutorials, computer tutorial, consultation hours

M 2.13 Module: Major Field: Energy Converting Engines [M-MACH-102838]

Responsible: Prof. Dr. Thomas Koch
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Language	Level	Version
12	Once	Deutsch	3	1

Election block: Kraft- und Arbeitsmaschinen (K) (at least 8 credits)			
T-MACH-105326	Hydraulic Fluid Machinery	8 CR	Pritz
T-MACH-105363	Thermal Turbomachines I	6 CR	Bauer
T-MACH-102194	Combustion Engines I	4 CR	Koch, Kubach
Election block: Kraft- und Arbeitsmaschinen (E) ()			
T-CIWVT-105780	Design of a jet engine combustion chamber	6 CR	Zarzalis
T-MACH-105184	Fuels and Lubricants for Combustion Engines	4 CR	Kehrwald, Kubach
T-MACH-105512	Experimental Fluid Mechanics	4 CR	Kriegseis
T-MACH-102093	Fluid Power Systems	4 CR	Geimer, Pult
T-MACH-105533	Gasdynamics	4 CR	Magagnato
T-MACH-105044	Fundamentals of Catalytic Exhaust Gas Aftertreatment	4 CR	Deutschmann, Grunwaldt, Kubach, Lox
T-MACH-105213	Fundamentals of Combustion I	4 CR	Maas, Sommerer
T-MACH-105325	Fundamentals of Combustion II	4 CR	Maas
T-MACH-105338	Numerical Fluid Mechanics	4 CR	Magagnato
T-MACH-105441	Development of Oil-Hydraulic Powertrain Systems	4 CR	Ays, Geerling
T-MACH-107447	Reliability Engineering 1	3 CR	Konnov
T-MACH-105364	Thermal Turbomachines II	6 CR	Bauer
T-MACH-105366	Turbo Jet Engines	4 CR	Bauer
T-MACH-105234	Windpower	4 CR	Lewald
T-MACH-105784	Vortex Dynamics	4 CR	Kriegseis
Election block: Kraft- und Arbeitsmaschinen (P) (at most 4 credits)			
T-MACH-105515	Introduction to Numerical Fluid Dynamics	4 CR	Pritz

Competence Certificate
refer to different brick descriptions of SP24

Competence Goal
Die Studierenden erwerben in den grundlagenorientierten Kernfächern des Schwerpunktes breite und fundierte Kenntnisse der wissenschaftlichen Theorien, Prinzipien und Methoden der Kraft- und Arbeitsmaschinen, um diese entwerfen, einsetzen und bewerten zu können.

Darauf aufbauend vertiefen die Studierenden in den Ergänzungsfächern ausgewählte Anwendungsfelder, sodass sie im Anschluss in der Lage sind, Probleme aus diesem Anwendungsfeld selbstständig zu analysieren, zu bewerten und hierauf aufbauend Lösungsansätze zu entwickeln.

Die Studierenden können nach Abschluss des Schwerpunkts insbesondere

- Funktion und Einsatz von Kraft- und Arbeitsmaschinen benennen,
- den Stand der Technik und daraus resultierende Anwendungsfelder der Kraft- und Arbeitsmaschinen beschreiben und am Beispiel anzuwenden,
- grundlegende Theorien, Methoden und Eigenschaften für die verschiedenen Anwendungsfelder der Kraft- und Arbeitsmaschinen benennen und diese einsetzen und bewerten.

Prerequisites
None

Content
refer to different brick descriptions of SP24

Recommendation
Recommended compulsory optional subject: Heat and mass transfer

Workload
The work load is 360 hours, corresponding to 12 credit points.

Learning type
Lectures and Exercises

2.14 Module: Major Field: Engineering Design (SP 10) [M-MACH-102815]

Responsible: Prof. Dr.-Ing. Albert Albers
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Language	Level	Version
12	Once	Deutsch/Englisch	3	2

Election block: Entwicklung und Konstruktion (K) (at least 8 credits)			
T-MACH-105233	Powertrain Systems Technology A: Automotive Systems	4 CR	Albers, Ott
T-MACH-105216	Powertrain Systems Technology B: Stationary Machinery	4 CR	Albers, Ott
T-MACH-105221	Lightweight Engineering Design	4 CR	Albers, Burkardt, Revfi
Election block: Entwicklung und Konstruktion (E) ()			
T-MACH-105215	Applied Tribology in Industrial Product Development	4 CR	Albers, Lorentz
T-MACH-105311	Design and Development of Mobile Machines	4 CR	Geimer, Siebert
T-MACH-105212	CAE-Workshop	4 CR	Albers
T-MACH-108374	Vehicle Ergonomics	4 CR	Heine
T-MACH-102105	Manufacturing Technology	8 CR	Schulze, Zanger
T-MACH-100092	Automotive Engineering I	8 CR	Gauterin, Unrau
T-MACH-102116	Fundamentals for Design of Motor-Vehicle Bodies I	2 CR	Bardehle
T-MACH-102119	Fundamentals for Design of Motor-Vehicle Bodies II	2 CR	Bardehle
T-MACH-105160	Fundamentals in the Development of Commercial Vehicles I	2 CR	Zürn
T-MACH-105161	Fundamentals in the Development of Commercial Vehicles II	2 CR	Zürn
T-MACH-105162	Fundamentals of Automobile Development I	2 CR	Frech
T-MACH-105163	Fundamentals of Automobile Development II	2 CR	Frech
T-MACH-105188	Integrative Strategies in Production and Development of High Performance Cars	4 CR	Schlichtenmayer
T-MACH-105330	Design with Plastics	4 CR	Liedel
T-MACH-105231	Leadership and Management Development	4 CR	Ploch
T-MACH-105440	Leadership and Conflict Management	4 CR	Hatzl
T-MACH-105441	Development of Oil-Hydraulic Powertrain Systems	4 CR	Ays, Geerling
T-MACH-105347	Project Management in Global Product Engineering Structures	4 CR	Gutzmer
T-MACH-102107	Quality Management	4 CR	Lanza
T-MACH-105171	Safety Engineering	4 CR	Kany
T-MACH-105696	Strategic product development - identification of potentials of innovative products	4 CR	Siebe
T-MACH-105358	Sustainable Product Engineering	4 CR	Ziegahn
T-MACH-105361	Technical Design in Product Development	4 CR	Schmid
T-MACH-109055	Machine Tools and Industrial Handling	8 CR	Fleischer
Election block: Entwicklung und Konstruktion (P) (at most 4 credits)			
T-MACH-105370	Laboratory Mechatronics	4 CR	Lorch, Seemann, Stiller
Election block: Entwicklung und Konstruktion (Ü) ()			
T-MACH-108887	Design and Development of Mobile Machines - Advance	0 CR	Geimer, Siebert

Competence Goal
The students are able to transfer their knowledge und abilities in product engineering to mechanical systems in research and industrial practice.

Prerequisites
None

Workload
The work load is about 360 hours, corresponding to 12 credit points.

Learning type
lectures
auditorium exercises
workshops

M 2.15 Module: Major Field: Fundamentals of Energy Technology [M-MACH-102816]

Responsible: Prof. Dr.-Ing. Hans-Jörg Bauer
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Level	Version
12	Once	3	1

Mandatory			
T-MACH-105220	Fundamentals of Energy Technology	8 CR	Badea, Cheng
Election block: Grundlagen der Energietechnik (K) ()			
T-MACH-105525	Introduction to Nuclear Energy	4 CR	Cheng
T-MACH-105325	Fundamentals of Combustion II	4 CR	Maas
T-MACH-105326	Hydraulic Fluid Machinery	8 CR	Pritz
Election block: Grundlagen der Energietechnik (E) ()			
T-MACH-105462	Selected Problems of Applied Reactor Physics and Exercises	4 CR	Dagan
T-MACH-105151	Energy Efficient Intralogistic Systems	4 CR	Braun, Schönung
T-MACH-105952	Energy Storage and Network Integration	4 CR	Jäger, Stieglitz
T-MACH-105408	Energy Systems I: Renewable Energy	6 CR	Dagan
T-MACH-105533	Gasdynamics	4 CR	Magagnato
T-MACH-105557	Microenergy Technologies	4 CR	Kohl
T-ETIT-101939	Photovoltaics	6 CR	Powalla
T-MACH-105537	Physical and Chemical Principles of Nuclear Energy in View of Reactor Accidents and Back-End of Nuclear Fuel Cycle	2 CR	Dagan
T-MACH-106493	Solar Thermal Energy Systems	4 CR	Dagan
T-MACH-105403	Flows and Heat Transfer in Energy Technology	4 CR	Cheng
T-MACH-105225	Thermal Solar Energy	4 CR	Stieglitz
T-MACH-105234	Windpower	4 CR	Lewald
T-MACH-105338	Numerical Fluid Mechanics	4 CR	Magagnato
Election block: Grundlagen der Energietechnik (P) (at most 4 credits)			
T-MACH-105331	Laboratory Exercise in Energy Technology	4 CR	Bauer, Maas, Wirbser
T-MACH-106707	Workshop on computer-based flow measurement techniques	4 CR	Bauer

Competence Goal
After completion of SP 15 students are able:

- to describe the elements of an energy system and their complex interactions,
- to list different conventional energy sources and assess their static range,
- to name the fluctuating supply of renewable energies such as wind, solar radiation, ocean currents and tides etc. and describe its effects on the energy system,
- to assess the effects of external and internal economic, ecological and technical boundary conditions of energy systems and to derive approaches for an optimal mix of different energy technologies,
- to explain the operational principle of well-established power plants as well as of power plants based on renewable energies.

Prerequisites
None

M 2.16 Module: Major Field: Information Management (SP 17) [M-MACH-102583]

Responsible: Prof. Dr.-Ing. Jivka Ovtcharova
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Language	Level	Version
12	Deutsch	3	1

Election block: Informationsmanagement (K) (at least 8 credits)			
T-MACH-106457	I4.0 Systems platform	4 CR	Maier, Ovtcharova
T-MACH-105147	Product Lifecycle Management	4 CR	Ovtcharova
T-MACH-102083	Integrated Information Systems for Engineers	4 CR	Ovtcharova
Election block: Informationsmanagement (E) ()			
T-MACH-106744	Agile product innovation management - value-driven planning of new products	4 CR	Kläger
T-MACH-105212	CAE-Workshop	4 CR	Albers
T-MACH-102209	Information Engineering	3 CR	Ovtcharova
T-MACH-102128	Information Systems and Supply Chain Management	3 CR	Kilger
T-MACH-105187	IT-Fundamentals of Logistics	4 CR	Thomas
T-MACH-105442	Intellectual Property Rights and Strategies in Industrial Companies	4 CR	Zacharias
T-MACH-102181	PLM for Product Development in Mechatronics	4 CR	Eigner
T-MACH-102155	Product, Process and Resource Integration in the Automotive Industry	4 CR	Ovtcharova
T-MACH-105347	Project Management in Global Product Engineering Structures	4 CR	Gutzmer
T-MACH-105181	Supply Chain Management	6 CR	Alicke
T-MACH-105358	Sustainable Product Engineering	4 CR	Ziegahn
Election block: Informationsmanagement (P) (at most 4 credits)			
T-MACH-102185	CATIA CAD Training Course	2 CR	Ovtcharova
T-MACH-102187	CAD-NX Training Course	2 CR	Ovtcharova
T-MACH-102153	PLM-CAD Workshop	4 CR	Ovtcharova
T-MACH-102149	Virtual Reality Practical Course	4 CR	Ovtcharova

Competence Certificate
Examination of other kind and oral and/or written examination: duration 2 hours.

Competence Goal
The students should:

Understand the relevance of information management in product development in consideration of increasing product and process complexity.

Gain basic knowledge in handling information, which is generated by product development activities along the lifecycle.

Prerequisites
None

Content
Generation and management of information

Architecture and functionality of information systems

CAX-systems

Workload
360 hours

M 2.17 Module: Major Field: Information Technology [M-MACH-102817]

Responsible: Prof. Dr.-Ing. Christoph Stiller
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Language	Level	Version
12	Once	Deutsch/Englisch	3	1

Election block: Informationstechnik (K) (at least 8 credits)			
T-MACH-105314	Computational Intelligence	4 CR	Jakob, Mikut, Reischl
T-MACH-105694	Data Analytics for Engineers	5 CR	Ludwig, Mikut, Reischl
T-MACH-105317	Digital Control	4 CR	Knoop
T-MACH-105223	Machine Vision	8 CR	Lauer, Stiller
T-MACH-105335	Measurement II	4 CR	Stiller
T-MACH-105360	Computer Engineering	6 CR	Keller, Lorch
Election block: Informationstechnik (E) ()			
T-MACH-105218	Automotive Vision	6 CR	Lauer, Stiller
T-MACH-102150	BUS-Controls	4 CR	Becker, Geimer
T-MACH-102128	Information Systems and Supply Chain Management	3 CR	Kilger
T-MACH-105328	Information Processing in Mechatronic Systems	4 CR	Kaufmann
T-MACH-105187	IT-Fundamentals of Logistics	4 CR	Thomas
T-MACH-105169	Engine Measurement Techniques	4 CR	Bernhardt
T-MACH-107447	Reliability Engineering 1	3 CR	Konnov
T-MACH-105185	Control Technology	4 CR	Gönnheimer
T-MACH-105367	Behaviour Generation for Vehicles	4 CR	Stiller, Werling
T-INFO-101466	Information Processing in Sensor Networks	6 CR	Hanebeck
Election block: Informationstechnik (P) (at most 4 credits)			
T-MACH-105370	Laboratory Mechatronics	4 CR	Lorch, Seemann, Stiller
T-MACH-105341	Lab Computer-Aided Methods for Measurement and Control	4 CR	Stiller
T-MACH-108889	BUS-Controls - Advance	0 CR	Daiß, Geimer

Competence Certificate
Oral exams: duration approx 5 min. per credit point.

However, amount, type and scope of the success control can vary according to the individually choice.

Competence Goal
Students are able to

- explain fundamentals of information technology for given problems in mechanical engineering an mechatronics.
- explain major methods for acquisition, processing and exploitation of information in technical systems.
- outline and to explain alternative methods to determine and to represent measurement uncertainties and their propagation in technical systems.
- explain information filters and fusion methods and understand their application to given problems.

Prerequisites
none

Content

- Techniques of information and data processing in mechanical engeneering
- Techniques of sensor data processing
- Concepts of controll theory
- Electronic devices for data processing

Workload
The work load is about 360 hours, corresponding to 12 credit points.

Learning type
lecture, practical training, exercise, prakticat training in laboratory

M 2.18 Module: Major Field: Materials Science and Engineering (SP 26) [M-MACH-102819]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Language	Level	Version
12	Once	Deutsch	3	1

Election block: Materialwissenschaft und Werkstofftechnik (K) (at least 8 credits)			
T-MACH-105301	Materials Science and Engineering III	8 CR	Heilmaier
Election block: Materialwissenschaft und Werkstofftechnik (E) ()			
T-MACH-105308	Atomistic Simulations and Molecular Dynamics	4 CR	Brandl, Gumbsch, Schneider
T-MACH-102141	Constitution and Properties of Wearresistant Materials	4 CR	Ulrich
T-MACH-105157	Foundry Technology	4 CR	Wilhelm
T-MACH-102111	Principles of Ceramic and Powder Metallurgy Processing	4 CR	Schell
T-MACH-100287	Introduction to Ceramics	6 CR	Hoffmann
T-MACH-105330	Design with Plastics	4 CR	Liedel
T-MACH-105164	Laser in Automotive Engineering	4 CR	Schneider
T-MACH-105333	Mechanics and Strength of Polymers	4 CR	von Bernstorff
T-MACH-105303	Modelling of Microstructures	5 CR	August, Nestler
T-MACH-102137	Polymer Engineering I	4 CR	Elsner
T-MACH-105724	Failure Analysis	4 CR	Greiner, Schneider
T-MACH-105170	Welding Technology	4 CR	Farajian
T-MACH-105354	Fatigue of Metallic Materials	4 CR	Lang
T-MACH-105362	Technology of Steel Components	4 CR	Schulze
T-MACH-102139	Failure of Structural Materials: Fatigue and Creep	4 CR	Gruber, Gumbsch
T-MACH-102140	Failure of Structural Materials: Deformation and Fracture	4 CR	Gumbsch, Weygand
T-MACH-107684	Materials Characterization	6 CR	Gibmeier
T-MACH-105211	Materials of Lightweight Construction	4 CR	Weidenmann
T-MACH-107685	Exercises for Materials Characterization	0 CR	Gibmeier
Election block: Materialwissenschaft und Werkstofftechnik (P) (at most 4 credits)			
T-MACH-105447	Metallographic Lab Class	4 CR	Hauf
T-MACH-102154	Laboratory Laser Materials Processing	4 CR	Schneider
T-MACH-105651	Biomechanics: design in nature and inspired by nature	4 CR	Mattheck

Competence Certificate
Oral exams: duration approx. 5 min. per credit point.

However, amount, type and scope of the success control can vary according to the individually choice.

Competence Goal
As part of a major field a specific subdomain of mechanical engineering is made accessible in breadth and depth. Students gain comprehensive knowledge in the core subjects and detailed knowledge in the supplementary subjects of the selected subdomain. They are able to generate new (scientific) solutions within this subdomain.

The specific learning outcomes are defined by the respective coordinator of the major field.

Prerequisites
None

Content
The comprehensive topic of the major field are the thermodynamical and kinetic basics of materials science that the students acquire within the core area (8 credit points). Moreover, there is a supplementary area of materials science and engineering which offers different subjects according to the students' interests.

Annotation
The module Materials Science and Engineering consists of 12 credit points in the bachelor´s program. Within that module, the students have to take lectures from a core area (8 credit points) and can select from a broad variation of courses within the supplementary area. For the bachelor´s program, a reduced catalogue exists (see Studienplan).

Workload
The work load is about 180 hours in the Bachelor of Science program, whereof the presence time is 66 h.

Learning type
In the core area of the major field Materials Science and Engineering the students choose from a small number of lectures and tutorials (obligatory).

Within the supplementary area students can choose not only lectures and tutorials but also lab courses and seminars.

M 2.19 Module: Major Field: Mechatronics (SP 31) [M-MACH-102820]

Responsible: Prof. Dr. Veit Hagenmeyer
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Language	Level	Version
12	Once	Deutsch/Englisch	3	1

Election block: Mechatronik (K) (at least 8 credits)			
T-MACH-105314	Computational Intelligence	4 CR	Jakob, Mikut, Reischl
T-MACH-105694	Data Analytics for Engineers	5 CR	Ludwig, Mikut, Reischl
T-MACH-100535	Introduction into Mechatronics	6 CR	Böhland, Lorch, Reischl
T-MACH-105209	Introduction into the Multi-Body Dynamics	5 CR	Seemann
T-MACH-105218	Automotive Vision	6 CR	Lauer, Stiller
T-MACH-105539	Modern Control Concepts I	4 CR	Groell, Matthes
T-MACH-105367	Behaviour Generation for Vehicles	4 CR	Stiller, Werling
Election block: Mechatronik (E) ()			
T-MACH-105217	Automation Systems	4 CR	Kaufmann
T-MACH-102150	BUS-Controls	4 CR	Becker, Geimer
T-MACH-105212	CAE-Workshop	4 CR	Albers
T-MACH-105317	Digital Control	4 CR	Knoop
T-ETIT-100784	Hybrid and Electric Vehicles	4 CR	Becker
T-MACH-105187	IT-Fundamentals of Logistics	4 CR	Thomas
T-MACH-105210	Machine Dynamics	5 CR	Proppe
T-MACH-105224	Machine Dynamics II	4 CR	Proppe
T-MACH-105334	Mechanics in Microtechnology	4 CR	Greiner, Gruber
T-MACH-105335	Measurement II	4 CR	Stiller
T-MACH-105557	Microenergy Technologies	4 CR	Kohl
T-MACH-108809	Micro- and nanosystem integration for medical, fluidic and optical applications	4 CR	Gengenbach, Hagenmeyer, Koker, Sieber
T-MACH-102152	Novel Actuators and Sensors	4 CR	Kohl, Sommer
T-MACH-105442	Intellectual Property Rights and Strategies in Industrial Companies	4 CR	Zacharias
T-MACH-105347	Project Management in Global Product Engineering Structures	4 CR	Gutzmer
T-INFO-108014	Robotics I - Introduction to Robotics	6 CR	Asfour
T-MACH-105358	Sustainable Product Engineering	4 CR	Ziegahn
T-MACH-105555	System Integration in Micro- and Nanotechnology	4 CR	Gengenbach
T-MACH-108844	Automated Manufacturing Systems	8 CR	Fleischer
T-MACH-108889	BUS-Controls - Advance	0 CR	Daiß, Geimer
T-INFO-101266	Human-Machine-Interaction	6 CR	Beigl
T-INFO-106257	Human-Machine-Interaction	0 CR	Beigl
T-ETIT-109313	Signals and Systems	6 CR	Puente León
Election block: Mechatronik (P) (at most 4 credits)			
T-MACH-105370	Laboratory Mechatronics	4 CR	Lorch, Seemann, Stiller
T-MACH-108878	Laboratory Production Metrology	4 CR	Häfner
T-MACH-102149	Virtual Reality Practical Course	4 CR	Ovtcharova

Competence Goal
Students of the topic mechatronics know the future-oriented procedures. They are able to individually and creatively solve interdisciplinary questions and learn to effectively combine tools from the individual disciplines.

Prerequisites
none

Content
The topic mechatronics offers a broad, multidisciplinary body of knowledge. The graduates are qualified to solve essential mechatronic questions. In particular the following disciplines are covered by the major mechatronics:

§ Mechanics and fluidics

§ Electronics

§ Information processing

§ Automation.

Workload
The work load is about 360 hours, corresponding to 12 credit points.

Learning type
The contents of this major field are taught in form of lectures, exercises and practical experiences.

M 2.20 Module: Major Field: Modeling and Simulation in Dynamics (SP 61) [M-MACH-104430]

Responsible: Prof. Dr.-Ing. Wolfgang Seemann
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Language	Level	Version
12	Deutsch	3	1

Election block: Modellbildung und Simulation in der Dynamik (K) (at least 8 credits)			
T-MACH-105209	Introduction into the Multi-Body Dynamics	5 CR	Seemann
T-MACH-105210	Machine Dynamics	5 CR	Proppe
T-MACH-105293	Mathematical Methods in Dynamics	5 CR	Proppe
T-MACH-105226	Dynamics of the Automotive Drive Train	5 CR	Fidlin
Election block: Modellbildung und Simulation in der Dynamik (E) ()			
T-MACH-105308	Atomistic Simulations and Molecular Dynamics	4 CR	Brandl, Gumbsch, Schneider
T-MACH-105294	Mathematical Methods of Vibration Theory	5 CR	Seemann
T-MACH-105172	Simulation of Coupled Systems	4 CR	Geimer, Xiang
T-MACH-105514	Experimental Dynamics	5 CR	Fidlin
T-MACH-105349	Computational Dynamics	4 CR	Proppe
T-MACH-105384	Computerized Multibody Dynamics	4 CR	Seemann
T-MACH-105224	Machine Dynamics II	4 CR	Proppe
T-MACH-105350	Computational Vehicle Dynamics	4 CR	Proppe
T-MACH-108888	Simulation of Coupled Systems - Advance	0 CR	Geimer, Xiang

Competence Certificate
oral examination

Prerequisites
None

Content
The module provides modeling competences and continues thus the compulsory courses in dynamics. To this end analytical methods for the modeling and examination of dynamical systems are presented. The simulation of the systems enables the students to do simulation studies in typical applications in dynamical systems of mechanical engineering to be able to evaluate and interpret the results.

M 2.21 Module: Major Field: Powertrain Systems (SP 02) [M-MACH-102812]

Responsible: Prof. Dr.-Ing. Albert Albers
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Level	Version
12	Once	3	1

Election block: Antriebssysteme (K) (at least 8 credits)			
T-MACH-105307	Drive Train of Mobile Machines	4 CR	Geimer, Wydra
T-MACH-105233	Powertrain Systems Technology A: Automotive Systems	4 CR	Albers, Ott
T-MACH-105216	Powertrain Systems Technology B: Stationary Machinery	4 CR	Albers, Ott
T-MACH-105226	Dynamics of the Automotive Drive Train	5 CR	Fidlin
Election block: Antriebssysteme (E) ()			
T-MACH-105215	Applied Tribology in Industrial Product Development	4 CR	Albers, Lorentz
T-MACH-105536	Dimensioning and Optimization of Power Train System	4 CR	Faust, Kirchner
T-MACH-105209	Introduction into the Multi-Body Dynamics	5 CR	Seemann
T-MACH-105151	Energy Efficient Intralogistic Systems	4 CR	Braun, Schönung
T-ETIT-100784	Hybrid and Electric Vehicles	4 CR	Becker
T-MACH-105187	IT-Fundamentals of Logistics	4 CR	Thomas
T-MACH-105231	Leadership and Management Development	4 CR	Ploch
T-MACH-105210	Machine Dynamics	5 CR	Proppe
T-MACH-105224	Machine Dynamics II	4 CR	Proppe
T-MACH-102152	Novel Actuators and Sensors	4 CR	Kohl, Sommer
T-MACH-105442	Intellectual Property Rights and Strategies in Industrial Companies	4 CR	Zacharias
T-MACH-105441	Development of Oil-Hydraulic Powertrain Systems	4 CR	Ays, Geerling
T-MACH-105347	Project Management in Global Product Engineering Structures	4 CR	Gutzmer
T-MACH-105185	Control Technology	4 CR	Gönnheimer
T-MACH-105696	Strategic product development - identification of potentials of innovative products	4 CR	Siebe
T-MACH-105358	Sustainable Product Engineering	4 CR	Ziegahn
T-MACH-105531	Tribology	8 CR	Dienwiebel, Scherge
T-MACH-102194	Combustion Engines I	4 CR	Koch, Kubach
T-MACH-102140	Failure of Structural Materials: Deformation and Fracture	4 CR	Gumbsch, Weygand
T-MACH-109303	Exercices - Tribology	0 CR	Dienwiebel

Competence Goal
The students know and understand the technical and physical basics and systematic connections of drive systems. The lecture deals vehicle drive systems as well as drive systems for stationary and mobile work machines.

They are able to choose, describe and use complex dimensioning- and design methods for drive systems under consideration of the interactions of the system.

Prerequisites
none

Workload
The work load is about 360 hours, corresponding to 12 credit points.

Learning type
lectures
auditorium exercises
workshops

M 2.22 Module: Major Field: Production Engineering (SP 52) [M-MACH-102644]

Responsible: Prof. Dr.-Ing. Gisela Lanza
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Language	Level	Version
12	Once	Englisch	3	1

Election block: Production Engineering (K) (at least 8 credits)			
T-MACH-106731	Global Production Engineering (MEI)	4 CR	Lanza
T-MACH-105379	Global Logistics	4 CR	Furmans
Election block: Production Engineering (E) ()			
T-MACH-106732	Automated Production Systems (MEI)	4 CR	Fleischer
T-MACH-106733	SmartFactory@Industry (MEI)	4 CR	Lanza

Competence Certificate
Oral exams: duration approx. 5 min per credit point
Amount, type and scope of the success control can vary according to the individually choice.

Competence Goal
After completion of this module, the students are able

- to analyse and solve planning and layout problems on the level of the enterprise, production, processes and work tasks,
- to plan and control a production,
- to evaluate and configure the quality and efficiency of production, processes and products.

Prerequisites
none

Content
The students acquire in the compulsory core subjects profound knowledge about the scientific theories, principles and methods of Production Engineering. Afterwards they are able to evaluate and design complex production systems according to problems of manufacturing and process technologies, materials handling, handling techniques, information engineering as well as production organisation and management.

Workload
The work load is about 360 hours, corresponding to 12 credit points.

Learning type
Lectures, seminars, workshops, excursions

M 2.23 Module: Major Field: Production Systems (SP 38) [M-MACH-102589]

Responsible: Prof. Dr.-Ing. Volker Schulze
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Language	Level	Version
12	Once	Deutsch	3	1

Election block: Produktionssysteme (K) (at least 8 credits)			
T-MACH-105518	Human Factors Engineering I	4 CR	Deml
T-MACH-105519	Human Factors Engineering II	4 CR	Deml
T-MACH-102105	Manufacturing Technology	8 CR	Schulze, Zanger
T-MACH-108849	Integrated Production Planning in the Age of Industry 4.0	8 CR	Lanza
T-MACH-102151	Material Flow in Logistic Systems	6 CR	Furmans
T-MACH-109055	Machine Tools and Industrial Handling	8 CR	Fleischer
Election block: Produktionssysteme (E) ()			
T-MACH-102162	Automated Manufacturing Systems	9 CR	Fleischer
T-MACH-105227	Design Project Machine Tools and Industrial Handling	4 CR	Fleischer
T-MACH-105165	Automotive Logistics	4 CR	Furmans
T-MACH-105147	Product Lifecycle Management	4 CR	Ovtcharova
T-MACH-102107	Quality Management	4 CR	Lanza
T-MACH-102083	Integrated Information Systems for Engineers	4 CR	Ovtcharova
Election block: Produktionssysteme (P) (at most 4 credits)			
T-MACH-108878	Laboratory Production Metrology	4 CR	Häfner

Competence Certificate
Oral exams: duration approx. 5 min per credit point

Written exams: duration approx. 20 - 25 min per credit point

Amount, type and scope of the success control can vary according to the individually choice.

Competence Goal
The students...

- are able to choose methods of production science target-oriented in familiar situations and are able to justify their selection.
- are able to describe and compare production processes exemplarily.
- are able to transfer known solutions to given problems in the field of production science under consideration of scientific theories, principles and methods.
- are able to solve tasks in the field of production science team oriented and proceed responsible and adequate to the situation.
- are able to integrate results of others at the solution of given problems.
- have the ability to present their own results in written form and are able to interpret them.
- are able to identify, dissect and develop further systems and processes and apply given sets of criteria under consideration of technical, economic and social conditions.

Prerequisites
None

Content
Within this module the students will get to know and learn about production science. Manifold lectures and excursions as part of several lectures provide specific insights into the field of production science.

Workload
The work load is about 360 hours, corresponding to 12 credit points.

Learning type
Lectures, seminars, workshops, excursions

M 2.24 Module: Major Field: Rail System Technology (SP 50) [M-MACH-102638]

Responsible: Prof. Dr.-Ing. Peter Gratzfeld
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Language	Level	Version
12	Once	Deutsch	3	1

Mandatory			
T-MACH-106424	Rail System Technology	4 CR	Gratzfeld
T-MACH-105353	Rail Vehicle Technology	4 CR	Gratzfeld
Election block: Bahnsystemtechnik (E) ()			
T-MACH-105540	Railways in the Transportation Market	4 CR	Gratzfeld
T-MACH-102121	Electric Rail Vehicles	4 CR	Gratzfeld
T-MACH-105237	Vehicle Lightweight Design - Strategies, Concepts, Materials	4 CR	Henning
T-MACH-105218	Automotive Vision	6 CR	Lauer, Stiller
T-MACH-105535	Composite Manufacturing - Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies	4 CR	Henning
T-MACH-104599	Project Management in Rail Industry	4 CR	Gratzfeld
T-MACH-105350	Computational Vehicle Dynamics	4 CR	Proppe
T-MACH-108692	Seminar for Rail System Technology	3 CR	Gratzfeld

Competence Certificate
Oral exams: duration approx. 5 minutes per credit point.

However, amount, type and scope of the success control can vary according the individual choice.

Competence Goal

- The students understand relations and interdependencies between rail vehicles, infrastructure and operation in a rail system.
- Based on operating requirements and legal framework they derive the requirements concerning a capable infrastructure and suitable concepts of rail vehicles.
- They recognize the impact of alignment, understand the important function of the wheel-rail-contact and estimate the impact of driving dynamics on the operating program.
- They evaluate the impact of operating concepts on safety and capacity of a rail system.
- They know the infrastructure to provide power supply to rail vehicles with different drive systems.

- The students learn the role of rail vehicles and understand their classification. They understand the basic structure und know the functions of the main systems. They understand the overall tasks of vehicle system technology.
- They learn functions and requirements of car bodies and jugde advantages and disadvantages of design principles. They know the functions of the car body's interfaces.
- They know about the basics of running dynamics and bogies.
- The students learn about advantages and disadvantages of different types of traction drives and judge, which one fits best for each application.
- They understand brakes from a vehicular and an operational point of view. They assess the fitness of different brake systems.
- They know the basic setup of train control management system and understand the most important functions.
- They specify and define suitable vehicle concepts based on requirements for modern rail vehicles.

- Supplementary lectures present further major aspects of a rail system.

Prerequisites
None

Content

1. Railway System: railway as system, subsystems and interdependencies, definitions, laws, rules, railway and environment, economic impact
2. Operation: Transportation, public transport, regional transport, long-distance transport, freight service, scheduling
3. Infrastructure: rail facilities, track alignment, railway stations, clearance diagram
4. Wheel-rail-contact: carrying of vehicle mass, adhesion, wheel guidance, current return
5. Vehicle dynamics: tractive and brake effort, driving resistance, inertial force, load cycles
6. Signaling and Control: operating procedure, succession of trains, European Train Control System, blocking period, automatic train control
7. Traction power supply: power supply of rail vehicles, power networks, filling stations
8. Vehicle system technology: structure and main systems of rail vehicles
9. Car body: functions, requirements, design principles, crash elements, interfaces
10. Bogies: forces, running gears, axle configuration
11. Drives: vehicle with/without contact wire, dual-mode vehicle
12. Brakes: tasks, basics, principles, blending, brake control
13. Train control management system: definitions, networks, bus systems, components, examples
14. Vehicle concepts: trams, metros, regional trains, intercity trains, high speed trains, double deck coaches, locomotives, freight wagons
15. History (optional)
16. Further contents in supplementary lectures

Annotation
A bibliography is available for download (Ilias-platform).

Workload

- Total effort at 12 ECTS (B.Sc.): about 360 hours
- Regular attendance: 63 hours
- Self-study: 63 hours
- Exam and preparation: 234 hours

Learning type
Lectures in the core part.

Lectures and seminars are offered in the supplementary part.

M 2.25 Module: Major Field: Technical Logistics (SP 44) [M-MACH-102821]

Responsible: Prof. Dr.-Ing. Kai Furmans
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Language	Level	Version
12	Once	Deutsch	3	1

Mandatory			
T-MACH-102163	Basics of Technical Logistics	6 CR	Mittwollen, Oellerich
Election block: Technische Logistik (K) (at least 2 credits)			
T-MACH-102160	Selected Applications of Technical Logistics	4 CR	Milushev, Mittwollen
T-MACH-102159	Elements and Systems of Technical Logistics	4 CR	Fischer, Mittwollen
T-MACH-108946	Elements and Systems of Technical Logistics - Project	2 CR	Fischer, Mittwollen
T-MACH-108945	Selected Applications of Technical Logistics - Project	2 CR	Milushev, Mittwollen
Election block: Technische Logistik (E) (at most 1 item)			
T-MACH-108844	Automated Manufacturing Systems	8 CR	Fleischer
T-MACH-105151	Energy Efficient Intralogistic Systems	4 CR	Braun, Schönung
T-MACH-105378	Cognitive Automobiles - Laboratory	6 CR	Kitt, Lauer, Stiller
T-MACH-105174	Warehousing and Distribution Systems	4 CR	Furmans
T-MACH-102151	Material Flow in Logistic Systems	6 CR	Furmans
T-WIWI-103091	Production and Logistics Controlling	3 CR	Rausch
T-MACH-102107	Quality Management	4 CR	Lanza
T-MACH-105171	Safety Engineering	4 CR	Kany
T-MACH-105367	Behaviour Generation for Vehicles	4 CR	Stiller, Werling

Competence Certificate
Oral exams: duration approx. 5 min. per credit point.

However, amount, type and scope of the success control can vary according to the individually choice.

Competence Goal
Students are able to:

- Describe main functional elements of of technical logistics,
- Determine the main parameters necessary for functionality,
- Combines those functional elements to solve material handling tasks appropriate, and
- Evalute resulting material handling installations.

Prerequisites
None

Content
The emphasis module *Technical Logistics* provides in-depth basics on the main topics of technical logistics. The module focuses on technical characteristics of material handling technology. To gain a deeper understanding, the course is accompanied by exercises.

Annotation
If LV 2117095 (basics of technical logistics) has been already examined sucessfully outside this emphasis module, another lecture from core-section can be chosen.

Workload
The work load is about 360 hours, corresponding to 12 credit points.

Learning type
Lectures and practices; self-study

M 2.26 Module: Major Field: Vehicle Technology (SP 12) [M-MACH-102818]

Responsible: Prof. Dr. Frank Gauterin
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Recurrence	Language	Level	Version
12	Once	Deutsch/Englisch	3	1

Election block: Kraftfahrzeugtechnik (K) (at least 8 credits)			
T-MACH-100092	Automotive Engineering I	8 CR	Gauterin, Unrau
Election block: Kraftfahrzeugtechnik (E) ()			
T-MACH-105655	Alternative Powertrain for Automobiles	4 CR	Noreikat
T-MACH-105233	Powertrain Systems Technology A: Automotive Systems	4 CR	Albers, Ott
T-MACH-105536	Dimensioning and Optimization of Power Train System	4 CR	Faust, Kirchner
T-MACH-105226	Dynamics of the Automotive Drive Train	5 CR	Fidlin
T-MACH-105152	Handling Characteristics of Motor Vehicles I	4 CR	Unrau
T-MACH-105153	Handling Characteristics of Motor Vehicles II	4 CR	Unrau
T-MACH-108374	Vehicle Ergonomics	4 CR	Heine
T-MACH-105154	Vehicle Comfort and Acoustics I	4 CR	Gauterin
T-MACH-105155	Vehicle Comfort and Acoustics II	4 CR	Gauterin
T-MACH-105237	Vehicle Lightweight Design - Strategies, Concepts, Materials	4 CR	Henning
T-MACH-105156	Vehicle Mechatronics I	4 CR	Ammon
T-MACH-102207	Tires and Wheel Development for Passenger Cars	4 CR	Leister
T-MACH-105218	Automotive Vision	6 CR	Lauer, Stiller
T-MACH-105535	Composite Manufacturing - Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies	4 CR	Henning
T-MACH-102117	Automotive Engineering II	4 CR	Gauterin, Unrau
T-MACH-105044	Fundamentals of Catalytic Exhaust Gas Aftertreatment	4 CR	Deutschmann, Grunwaldt, Kubach, Lox
T-MACH-102116	Fundamentals for Design of Motor-Vehicle Bodies I	2 CR	Bardehle
T-MACH-102119	Fundamentals for Design of Motor-Vehicle Bodies II	2 CR	Bardehle
T-MACH-105160	Fundamentals in the Development of Commercial Vehicles I	2 CR	Zürn
T-MACH-105161	Fundamentals in the Development of Commercial Vehicles II	2 CR	Zürn
T-MACH-105162	Fundamentals of Automobile Development I	2 CR	Frech
T-MACH-105163	Fundamentals of Automobile Development II	2 CR	Frech
T-ETIT-100784	Hybrid and Electric Vehicles	4 CR	Becker
T-MACH-105375	Industrial Aerodynamics	4 CR	Breitling, Frohnapfel
T-MACH-105188	Integrative Strategies in Production and Development of High Performance Cars	4 CR	Schlichtenmayer
T-MACH-105221	Lightweight Engineering Design	4 CR	Albers, Burkardt, Revfi
T-MACH-105164	Laser in Automotive Engineering	4 CR	Schneider
T-MACH-105166	Materials and Processes for Body Leightweight Construction in the Automotive Industry	4 CR	Kienzle, Steegmüller
T-MACH-105442	Intellectual Property Rights and Strategies in Industrial Companies	4 CR	Zacharias
T-MACH-102155	Product, Process and Resource Integration in the Automotive Industry	4 CR	Ovtcharova
T-MACH-102156	Project Workshop: Automotive Engineering	6 CR	Frey, Gauterin, Gießler
T-MACH-105441	Development of Oil-Hydraulic Powertrain Systems	4 CR	Ays, Geerling

T-MACH-105347	Project Management in Global Product Engineering Structures	4 CR	Gutzmer
T-MACH-105350	Computational Vehicle Dynamics	4 CR	Proppe
T-MACH-105696	Strategic product development - identification of potentials of innovative products	4 CR	Siebe
T-MACH-105358	Sustainable Product Engineering	4 CR	Ziegahn
T-MACH-102194	Combustion Engines I	4 CR	Koch, Kubach
T-MACH-105367	Behaviour Generation for Vehicles	4 CR	Stiller, Werling
T-MACH-102148	Gear Cutting Technology	4 CR	Klaiber
T-MACH-108844	Automated Manufacturing Systems	8 CR	Fleischer

Competence Certificate
Valid for all degree programmes, for which no value is indicated in the following.

The assessment is carried out as partial exams of the single courses of this module, whose sum of credits must meet the minimum requirement of credits of this module. The assessment procedures are described for each course of the module separately. Amount, type and scope of the success controll can vary according to the individually choice. Oral exams: duration approx. 5 min. per credit point. Within the scope of lab courses maximum 4 credits may be aquired.

The overall grade of the module is the average of the grades for each course weighted by the credits and truncated after the first decimal.

Competence Goal
The student

• knows the most important components of a vehicle,

• knows and understands the functioning and the interaction of the individual components,

• knows the basics of dimensioning the components,

• knows and understands the procedures in automobile development,

• knows and understands the technical specifications at the development procedures,

• is aware of notable boundaries like legislation,

• is ready to analyze and judge vehicle concepts and to participate competently in the development of vehicles.

Prerequisites
None

Content
In the module Automotive Technology the basics are taught, which are important for the development, the design, the production and the operation of vehicles. Particularly the primary important aggregates like engine, gear, drive train, chasis and auxiliary equipment are explained, but also all technical equipment, which make the operation safer and easier. Additionally the interior equipment is examined, which shall provide a preferably comfortable, optimum ambience to the user.

In the module Automotive Technology the focus is on passenger cars and commercial vehicles, which are designed for road applications.

Workload
The work load is about 360 hours, corresponding to 12 credit points.

Learning type
The teaching and learning procedures (lecture, lab course, workshop) are described for each course of the module separately.

M 2.27 Module: Major Field: Vibration Theory [M-MACH-104442]

Responsible: Prof. Dr.-Ing. Alexander Fidlin
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering (Schwerpunkt)

Credits	Language	Level	Version
12	Deutsch	3	1

Election block: Schwingungslehre (K) (at least 8 credits)			
T-MACH-105290	Vibration Theory	5 CR	Fidlin
T-MACH-105210	Machine Dynamics	5 CR	Proppe
T-MACH-105294	Mathematical Methods of Vibration Theory	5 CR	Seemann
T-MACH-105372	Theory of Stability	6 CR	Fidlin
T-MACH-105439	Introduction to Nonlinear Vibrations	7 CR	Fidlin
Election block: Schwingungslehre (E) (at most 1 item)			
T-MACH-105224	Machine Dynamics II	4 CR	Proppe
T-MACH-105443	Wave Propagation	4 CR	Seemann
T-MACH-105226	Dynamics of the Automotive Drive Train	5 CR	Fidlin
T-MACH-105514	Experimental Dynamics	5 CR	Fidlin
T-MACH-105154	Vehicle Comfort and Acoustics I	4 CR	Gauterin
T-MACH-105155	Vehicle Comfort and Acoustics II	4 CR	Gauterin
T-MACH-105349	Computational Dynamics	4 CR	Proppe
Election block: Schwingungslehre (P) (at most 4 credits)			
T-MACH-105373	Practical Training in Measurement of Vibrations	4 CR	Fidlin

Competence Certificate
oral examination

Prerequisites
None

Content
The students know different methods which may be applied for the analysis of investigation of vibration problems. They are able to treat one or multiple degree of freedom systems as well as vibrating continua. The goal is to establish a chain from physical modeling via mathematical solution to an interpretation of the results. Based on the courses which are chosen the knowledge has emphasis on theoretical investigations, approximation methods or experimental methods and applications in automotive engineering.

M 2.28 Module: Manufacturing Processes [M-MACH-102549]

Responsible: Prof. Dr.-Ing. Volker Schulze
Dr.-Ing. Frederik Zanger

Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Language	Level	Version
4	Deutsch	3	1

Mandatory			
T-MACH-105219	Basics of Manufacturing Technology	4 CR	Schulze, Zanger

Competence Certificate
written exam (duration: 60 min)

Competence Goal
The students …

- are able to classify the manufacturing processes by their general functionality according to the specific main groups (DIN 8580).
- have the ability to declare and explain the function of the significant manufacturing processes of the main groups (DIN 8580).
- are enabled to describe the characteristic process features (geometry, materials, accuracy, tools, machines) of the significant manufacturing processes of the main groups (DIN 8580).
- have the ability to derive the relevant process specific technical advantages and disadvantages of the characteristic process features.
- are enabled to perform a selection of suitable manufacturing processes for given components.
- are enabled to classify the required manufacturing processes in the expiry of a process chain for the production of given sample products.

Prerequisites
none

Content
The objective of the lecture is to classify the manufacturing technology within the wider context of production engineering, to provide an overview of the different manufacturing processes and to establish basic process knowledge of the common processes. The lecture conveys the basic principles of manufacturing technology and deals with the manufacturing processes based on example components according to their classification into main groups regarding technical and economic aspects.

The following topics will be covered:

- Primary processing (casting, plastics engineering, sintering, additive manufacturing processes)
- Forming (sheet-metal forming, massive forming)
- Cutting (machining with geometrically defined and geometrically undefined cutting edges, separating, abrading)
- Joining
- Coating
- Heat treatment and surface treatment

Workload
regular attendance: 21 hoursself-study: 99 hours

Learning type
Lecture

M 2.29 Module: Materials Science (BSc-Modul 04, WK) [M-MACH-102562]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Duration	Language	Level	Version
14	2 term	Deutsch/Englisch	3	2

Mandatory			
T-MACH-105145	Materials Science I & II	11 CR	Gibmeier, Heilmaier, Weidenmann
T-MACH-105146	Materials Science Lab Course	3 CR	Heilmaier, Möslang, Weidenmann

Competence Certificate
not graded: participation in 10 lab experiments, introductory colloquia must be passed and 1 short presentation must be presented. The lab course must be finished successfully prior to the registration for the oral exam;

graded: oral exam covering the whole module, about 25 minutes.

Competence Goal
Within this Module the students should

- gain knowledge of basics about structural and functional materials
- be able to draw relationships between atomic structure, microstructure and properties
- be able to apply appropriate methods to determine mechanical and other relevant properties as well as to characterize the microstructure of materials
- be able to assess material properties and corresponding applications

Prerequisites
none

Content
WK I

Structure of atoms and atomic bonding

Crystalline solids

Defects in crystalline solids

Amorphous and partially crystalline solids

Constitution of alloys and materials

Diffusion and phase transformation in the solid state

Microscopic characterization method

Characterization with X-Rays and neutrons

Non-destructive Testing

Mechanical Testing

WK II

Iron based alloys

Non-iron based alloys

Ceramics

Glases

Polymers

Composite Materials

Annotation
For the Bachelor’s program Mechanical Engineering the module (including all brick details, exams and courses) is offered in German.

For the Bachelor’s program Mechanical Engineering (International) the module (including all brick details, exams and courses) is offered in English.

Workload
The work load of the module is about 420 hours.

The workload for the lab course Materials Science is 90 h in total and consists of the presence during the 10 experiments (one week half-time, 4 hours per day) as well as preparation and rework time at home.

The workload for the lecture Materials Science I & II is 165 h per semester and consists of the presence during the lectures (WS: 4 SWS, SS: 2SWS) and the exercises (1 SWS per WS and 1 SWS per SS) as well as preparation and rework time at home.

Learning type
The module "Materials Science" consists of the lectures "Materials Science I and II" with additional tutorials for small groups and a one week materials science laboratory course.

M 2.30 Module: Measurement and Control Systems (BSc-Modul 11, MRT) [M-MACH-102564]

Responsible: Prof. Dr.-Ing. Christoph Stiller
Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Duration	Language	Level	Version
7	1 term	Deutsch/Englisch	3	2

Mandatory			
T-MACH-104745	Basics in Measurement and Control Systems	7 CR	Stiller

Competence Certificate
Type of Examination: written exam

Duration of Examination: 150 minutes

Competence Goal

- Students are able to name, describe and explain control principles applied to physical quantities.
- They are able to name, analyze and assess system theoretic characteristics of dynamical systems.
- Students are able to represent real systems in a system theoretic model and to assess the suitability of a given model.
- Students are able to apply methods for controller design and to analyze their properties.
- Students are able to select appropriate principles of metrology and to model, analyze and assess measurement setups.
- Students are able to quantify and assess measurement uncertainties.

Module grade calculation
result of exam

Prerequisites
none

Content
1. Dynamic systems
2. Properties of important systems and modeling
3. Transfer characteristics and stability
4. Controller design
5. Fundamentals of measurement
6. Estimation
7. Sensors
8. Introduction to digital measurement

Annotation
For the Bachelor's program Mechanical Engineering the module (including all brick details, exams and courses) is offered in German.

For the Bachelor's program Mechanical Engineering (International) the module (including all brick details, exams and courses) is offered in English.

Workload
84 hours presence time, 126 hours selfstudies

Learning type
Lecture

Tutorials

M 2.31 Module: Mechanical Design (BSc-Modul 06, MKL) [M-MACH-102573]

Responsible: Prof. Dr.-Ing. Albert Albers
Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Language	Level	Version
20	Deutsch/Englisch	3	2

Mandatory			
T-MACH-105286	Mechanical Design I & II	7 CR	Albers, Burkardt, Matthiesen
T-MACH-104810	Mechanical Design III & IV	13 CR	Albers, Burkardt, Matthiesen
T-MACH-105282	Mechanical Design I, prerequisites	0 CR	Albers, Matthiesen
T-MACH-105283	Mechanical Design II, prerequisites	0 CR	Albers, Matthiesen
T-MACH-105284	Mechanical Design III, Constructing the Team	0 CR	Albers, Matthiesen
T-MACH-105285	Mechanical Design IV, Constructing the Team	0 CR	Albers, Matthiesen

Competence Certificate
Mechanical Design I & II:

Preliminary examination: Successful participation in workshops in the field of mechanical Design I, as well as successful processing of output power in mechanical design II

Written examination in the field of mechanical engineering I and II: duration 60 min plus reading time

Mechanical Design III & IV:

Preliminary examination: Successful participation in workshops in the field of mechanical Design III & IV

- Examination in the field of mechanical Design III & IV consisting of
  written part with duration 60 min plus reading time and
- constructive part with duration 180 min plus reading ime

Competence Goal
Learning object springs:

- be able to recognize spring types and explain stress
- Identify and describe the properties of a resilient LSS in machine elements presented later on
- Understanding and explaining the principle of action
- Know and list areas of application for springs
- graphically illustrate the load and the resulting stresses
- be able to describe the degree of species usefulness as a means of lightweight construction
- be able to analyse different solution variants with regard to lightweight construction (use species efficiency)
- Being able to explain several springs as a circuit and calculate total spring stiffness

Learning objects Technical Systems:

- Being able to explain what a technical system is
- "Thinking in systems."
- Using system technology as an abstraction tool for handling complexity
- Recognizing functional relationships of technical systems
- Getting to know the concept of function
- be able to use C&C²-A as a means of system technology

Learning objects Visualization:

- Ability to create and interpret schematics
- Using freehand technical drawing as a means of communication
- To be able to apply the technical basics of freehand drawing
- Derivation of 2D representations into different perspective representations of technical structures and vice versa
- Master reading of technical drawings
- Dedicated dimensioning of technical drawings
- Create sectional views of technical systems as a technical sketch

Learning objects Bearings:

- be able to recognize bearings in machine systems and explain their basic functions
- name bearings (type/type/function) and recognize them in machine systems and technical drawings
- Being able to name areas of application and selection criteria for the various bearings and bearing arrangements and explain interrelationships
- Ability to functionally explain the design of the bearing definitions in different directions radially/axially and circumferentially
- Know and describe selection as an iterative process as an example
- be able to perform dimensioning of bearing arrangements as an example of the engineer's approach to dimensioning machine elements
- Develop first ideas for probabilities in predicting the life of machine elements
- Recognise from the damage pattern whether static or dynamic overload was the cause of material failure
- Calculate equivalent static and dynamic bearing loads from the catalogue and given external forces on the bearing
- Being able to name, explain and transfer the basic equation of the dimensioning to the bearing dimensioning

Learning objectives seals:

The students…

- can discuss the basic functions of seals
- can describe the physical causes for mass transfer
- can apply the C&C-Model on seals
- can name, describe and apply the three most important classification criteria of seals
- can explain the function of a contacting seal and a non-contacting seal.
- can differentiate the seal types and organize them to the classification criteria.
- can discuss the structure and the effect of a radial shaft seal
- can evaluate radial shaft seals, compression packings, mechanical seals, gap seals and labyrinth seals
- can describe and apply the constructional principle of selffortification
- can describe the stick-slip phenomenon during the movement sequences of a reciprocating seal

Learning design:

The students…

- understand the meaning of design
- are able to recognize and implement basic rules and principles of design
- are able to design the connection of partial systems into the total system
- can name requirements of design and take them into account
- know the main groups of manufacturing methods
- are able to explain the manufacturing processes
- are able to depict a casted design in a drawing clearly, e.g. draft of the mold, no material accumulation, …
- know how components are designed

- Know how the production of the components has an effect on
- their design
- Know the requirements and boundary conditions on design

Learning bolted connections:

The students…

- can list and explain various bolt applications.
- can recognize bolt types and explain their function
- can build a C&C² model of a bolted joint and discuss the influences on its function
- can explain the function of a bolted connection with the help of a spring model
- can reproduce, apply and discuss the screw equation.
- Can estimate the load-bearing capacity of low-loaded bolted joints for dimensioning purposes
- Can indicate which bolted joint is to be calculated and which only roughly dimensioned.
- Can carry out the dimensioning of bolted connections as flange connections
- Can create, explain and discuss the force deflection diagram of a bolted connection

Learning objectives tolerances and fits:

The students…

- know the importance of the microstructure of working surfaces on technical surfaces on the function. They are familiar with a system for describing the surface microstructure in technology and parameters for describing the surface fine structure of working surfaces both in their definition and in their statement and in the quantitative order of magnitude.
- know and can explain surface measurement principles.
- know the relationship between the surface structure and the manufacturing processes and the costs.
- know the purpose of standards, standard types and preferred numbers.
- know and can define tolerances as a description of the geometry of working surfaces. They know the ISO fitting systems in type and structure and can apply it.
- can explain the different types of toleration and their significance for the economic product development process.

Learning objectives component connections:

The students…

- can generally explain basic functions of shaft-hub-connections.
- know and can explain a selection of different component connections to the respective working principles.
- can explain the component connection "centering" in its function and draw it in a technical drawing.
- understand form-closing and force-closing shaft-hub connections and can explain them. They can dimension a cylindrical interference fit (calculation and dimensioning criteria) and understand the stresses on a cylindrical interference fit and can display them graphically.

Learning objectives gears:

The students…

- Understand the function of gearboxes in the context of drive systems.
- are familiar with different operating principles of gearboxes and different types of gearboxes.
- know and understand the law of gearing. They know names on the gear and different flank curves.
- Understand engagement of gears, application limits and damage to gears. They know the basic ideas of gear dimensioning.
- know and understand planetary gearboxes. They understand the operating principle of hydraulic transmissions.

Learning objects dimensioning

Students can...

- Explain the target values of the economic dimensioning
- explain what are the main results of a dimensioning process
- explain the scope of the dimensioning (economic and legal significance)
- Explain the basic sizing procedure and record it as a generic flowchart
- Explain uncertainties in dimensioning
- specify the different basic procedures, both for dimensioning and for determining the influencing variables, e.g. loads, as well as their advantages or disadvantages in relation to each other
- explain different types of calculation methods and their characteristics (static/dynamic, local vs. nominal voltages)
- Name different types of failure (implies the definition of failure)
- Explain possible causes of failure
- provide suitable replacement models for simple subsystems of technical systems as a basis for dimensioning
- Explain different basic load types for given examples Dominant load types relevant to design
- Use the basics of elastostatics for all basic load cases to design components that can be modeled as linear structures according to the nominal stress concept.
- describe the dimensioning parameters presented in the VL and their use (shape number, shape yield strength, shape yield strength ratio)
- explain the purpose of strength hypotheses

- explain the strength hypotheses for metallic materials presented in the VL and select them according to the specific situation
- explain the principal effects of notches, including the factors affecting the magnitude of these effects
- describe how notches can be taken into account in the dimensioning process
- notched components that can be modeled as linear load-bearing structures for static loads
- Explain possibilities for determining the strength of a material or component
- Name influencing variables on the loadability and derive measures from them in order to influence the loadability of a component if necessary.
- describe different types of material behaviour under overelastic stressing of metallic materials
- Describe dynamic loads
- from Wöhler, Haigh- or Smith diagrams determine material characteristics for the loadability under given load conditions
- construct the Smith chart approximately with the given characteristic values
- explain the difference between strength and fatigue strength
- Components that can be modeled as linear structures according to the nominal stress concept for dynamic loads in base load cases and combined loads in the same phase
- for components that can be modeled as linear structures, explain the design approach presented in the lecture for any combined, dynamic loads
- Perform strength analyses in accordance with DIN 743, in the course of which even failure-critical points in the component can be identified and, if the result is negative, appropriate measures can be derived and evaluated.
- Name factors influencing the safety factors to be selected and explain what type of influence this is

Learning objectives shaft couplings:

Students can...

- Name the reasons for using shaft couplings (in short: "Couplings")
- name exemplary applications of couplings
- List basic functions of clutches and delimit clutches to transmissions
- indicate the basic power balance of a coupling
- mention various ancillary functions that occur with clutches
- name various criteria for classifying couplings
- describe the embodiment-function relationship for a given coupling for both main and secondary functions
- If necessary, derive the main and auxiliary functions required for the application, select a suitable coupling (and if necessary also a specific size) or combine several couplings if necessary.
- Explain interactions of couplings with adjacent subsystems, possibly specific to certain designs or groups of couplings
- Specify selection criteria for couplings
- explain central design principles for different groups of couplings, including the designation of key design targets
- for frictionally engageable clutches, slip time, transferable torque and thermal resistance should be designed roughly under the assumptions and simplifications dealt with in the lecture, estimate the relevant loads by the surrounding technical system and, if necessary, influence the specified target values by design measures.
- Apply relevant standards for the design of couplings
- Name possible failure modes for given couplings
- specify which design measures on a coupling can be used to influence the dynamic behaviour of the surrounding system in a desired direction
- explain the various possible actuation types for switchable clutches and give examples of corresponding clutch designs

Learning Objectives Fundamentals of Fluid Technology:

Students can...

- differentiate between different areas of fluid technology on the basis of essential aspects of the operating principles
- Identify properties/ special features of fluid technology systems and the resulting areas of application
- explain basic approaches for the design of hydraulic systems
- differentiate the flow types shown in the lecture
- with the basic equations (continuity equation, Bernoulli,...) of hydrostatics and hydrodynamics explained in the lecture.
- Identify sources of pressure losses in hydraulic systems and influencing factors
- designate basic subsystems of a hydraulic system
- Assign system and component examples shown in the lecture to components of a hydraulic system
- name the symbols shown in the lecture and assign them to the respective system/component
- use symbols to explain the function of simple hydraulic systems
- Draw up function diagrams for hydraulic systems that are similar in complexity to the systems shown in the lecture.

Prerequisites
None

Content
MKL I:

Introduction to mechanical design

Tools for visualization (technical drawing)

Product Development as a problem solution

Technical Systems Product Development

- Systems theroy
- Contact and Channel Approach C&C²-A

Basics of selected construction and machine elements

- springs
- Bearing and fence

The lecture is accompanied by exercises with the following content:

gear workshop

Exercises for visualization tools (technical drawing)

Exercise on Technical Systems Product Creation

- Systems theroy
- Contact and Channel Approach C&C²-A

Exercise on the spring module

Exercise on the bearing and fence Module

MKL II:

- Basics bearings
- Sealings
- Design
- Tolerances and fits
- component connections
- The lecture is accompanied by exercises to deepen the contents of the lecture.

MKL III:

- component connections
- tolerances and fits
- gears
-

MKL IV:

Elementary component connections - Part 2

Basics of clutches

- Function and operating principles
- Characteristic features and classification
- Non-engaging shaft clutches
- Switchable shaft clutches
- Flexible clucthes

Basics of gearboxes

- Function and operating principles
- Basics of gear drives
- Characteristic features and classification
- selection criteria
- Basics of other transmissions
- Fundamentals of lubrication and lubricants

Basics of gearing

- Function and operating principles
- Types of thoothing
- Cycloid as flank curve
- Involute as flank curve
  Method of manufacturing gears
- Profil overlap
- Profil offset
- Limits of application and damage

- Dimensioning
- Thooth strength
- Pitting resistance

Basics of hydraulics

- Basic functions and operating principles
- Characteristic features and classification
- Types and properties
- Sample
- Application
- Design calculation

Annotation
For the Bachelor's program Mechanical Engineering the module (including all brick details, exams and courses) is offered in German.

For the Bachelor's program Mechanical Engineering (International) the module (including all brick details, exams and courses) is offered in English.

Workload
MKL1:
Attendance at lectures (15 VL): 22,5h

Presence exercises (8 exercises): 12h

Attendance (3x 2h) and preparation (3x3h) Workshop sessions: 15h

Preparation and execution of online test: 6h

Personal preparation and follow-up of lecture and exercise: 34,5hMKL1:

MKL2:

Attendance lectures (15 VL): 22,5h

Presence exercises (7 ÜB): 10,5h

Personal preparation and follow-up of lecture and exercise, incl. prerequisite and preparation for the exam:: 117h

MKL 3:

Attendance lectures (15 L): 22,5h

Presence exercises (4 exercises): 6h

Attendance milestones project work (3x 4h): 12h

Project work in a team: 80h

Personal preparation and follow-up of lecture and exercise: 29,5h

MKL 4:

Attendance lectures (13 L): 19,5h

Presence exercises (6 exercises): 9h

Attendance milestones project work (3x 4h): 12h

Project work in a team: 120h

Personal preparation and follow-up of lecture and exercise, incl. preparation for the exam: 82,5h

Learning type
Lecture

Tutorial

Project work during the semester

M 2.32 Module: Orientation Exam [M-MACH-104624]

Organisation: University
Part of: Orientation Exam

Credits	Language	Level	Version
0	Deutsch	3	1

Mandatory			
T-MATH-100275	Advanced Mathematics I	7 CR	Arens, Griesmaier, Hettlich
T-MACH-100282	Engineering Mechanics I	7 CR	Böhlke, Langhoff
T-MACH-100283	Engineering Mechanics II	6 CR	Böhlke, Langhoff

Modelled deadline
This module must be passed until the end of the **3. term**.

M 2.33 Module: Physics [M-PHYS-104030]

Responsible: Prof. Dr. Gernot Goll
Prof. Dr. Bernd Pilawa

Organisation: KIT Department of Physics

Part of: Fundamentals of Engineering

Credits	Language	Level	Version
5	Deutsch/Englisch	3	1

Mandatory			
T-PHYS-108322	Wave and Quantum Physics	5 CR	Goll, Pilawa

Competence Certificate
The assessment consists of a written exam according to Section 4(2), 1 of the examination regulation.

Competence Goal
The students

- are familiar with the properties of waves and can discuss those
- can reflect on the principles of relativity
- comprehend the coherence of the particle and wave description of light and matter
- can explain the limits of wave physics
- are able the apply the Schrödinger-equation to basic problems in quantum mechanics
- can explain the basic properties of atoms, especially for the hydrogen atom
- can discuss fundamental aspects of the electronic properties of solids

Prerequisites
None

Content

- Properties of waves
- Acoustic and electromagnetic waves
- Interference and diffraction
- Relativity
- Wave-particle dualism
- Basic properties of atoms
- Basic electronic properties of solids

Annotation
For the Bachelor’s program Mechanical Engineering the module (including all brick details, exams and courses) is offered in German.

For the Bachelor’s program Mechanical Engineering (International) the module (including all brick details, exams and courses) is offered in English.

Workload
150 hours, consisting of attendance times (45), follow-up of the lecture including exam preparation and preparation of exercises (105)

Learning type
Lecture and Tutorial

M 2.34 Module: Production Operations Management [M-MACH-100297]

Responsible: Prof. Dr.-Ing. Kai Furmans
Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Language	Level	Version
5	Deutsch/Englisch	3	2

Mandatory			
T-MACH-100304	Production Operations Management	3 CR	Furmans, Lanza, Schultmann
T-MACH-108734	Production Operations Management-Project	2 CR	Furmans, Lanza

Competence Certificate
The success control takes place in the form of partial examinations in the individual courses of the module. These are a written exam (duration: 90 minutes) and a different type of examination. The module grade is made up of the grades of the courses in the module weighted by credit points.

Competence Goal
If you successfully passed this course you will be able to:

- state the relevant technical terms of business administration, logistics and production engineering
- describe the interrelation between these technical terms
- describe the most important decision problems qualitatively and quantitatively
- apply the appropriate decision models to solve the respective decision problems
- critically evaluate the results and draw appropriate conclusions
- extend the learned methods and models by researching on you own

Prerequisites
none

Content
The institutes alternate with each cycle. Basic skills about the planning and operation of a production plant are taught. The lecture covers the basics of operations and supply chain management as well as business management basics in accounting, investment calculation and legal forms.

Annotation
It is a joint module of the Institute of Materials Handling and Logistics (IFL) and the Institute of Production Science (WBK).

For the Bachelor's program Mechanical Engineering the module (including all brick details, exams and courses) is offered in German.

For the Bachelor's program Mechanical Engineering (International) the module (including all brick details, exams and courses) is offered in English.

Workload
Attendance time: 42 hours,

Self-study: 108 hours

Learning type

1. Lectures (Obligatory)
2. Tutorials (Obligatory)
3. Group work (Obligatory)
4. Oral defense of the group work (Obligatory)

M 2.35 Module: Technical Thermodynamics (BSc-Modul 05, TTD) [M-MACH-102574]

Responsible: Prof. Dr. Ulrich Maas
Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Duration	Language	Level	Version
15	2 term	Deutsch/Englisch	3	1

Mandatory			
T-MACH-104747	Technical Thermodynamics and Heat Transfer I	8 CR	Maas
T-MACH-105287	Technical Thermodynamics and Heat Transfer II	7 CR	Maas
T-MACH-105204	Excercises in Technical Thermodynamics and Heat Transfer I	0 CR	Maas
T-MACH-105288	Excercises in Technical Thermodynamics and Heat Transfer II	0 CR	Maas

Competence Certificate
Prerequisite: attestation each semester by homework assignments

Thermodynamics I: Written exam, graded, 3 hours

Thermodynamics II: Written exam, graded, 3 hours

Competence Goal
The students acquire the competency to master the fundamentals of thermodynamics and the ability to apply the knowledge an problem-solving in various branches of mechanical engineering and especially in the Energy Technology sector.

An integral part of the model is that students can define the fundamental laws of thermodynamics and their application. The students are competent in describing and comparing the main processes in energy conversion. Using tools also applied in Industry they are capable of analysing and rating the efficiency of processes. The students are capable of discussing the thermodynamical correlation of ideal gas mixtures, real gases and of humid air as well analysing them with the help of the laws of thermodynamic. Furthermore the students are capable of defining and applying the heattransfer mechanisms.

Module grade calculation
weight according to CP

Prerequisites
None

Content
Thermodynamics I:

- System, properties of state
- Chemical and thermodynamic properties of pure components
- Absolute temperature, model systems
- 1st law of thermodynamics for resting and moved systems Entropy and 2nd law of thermodynamics
- Behavior of real substances described by tables, diagrams and equations of state
- Machine processes

Thermodynamics II:

- Repetition of the topics of “Thermodynamics and Heat Transfer I”
- Mixtures of ideal gases
- Moist air
- Behaviour of real substances described by equations of state
- Applications of the laws of thermodynamics to chemical reactions

Annotation
For the Bachelor’s program Mechanical Engineering the module (including all brick details, exams and courses) is offered in German.

For the Bachelor’s program Mechanical Engineering (International) the module (including all brick details, exams and courses) is offered in English.

Workload
lectures and exercises: 150h

homework and preparation of examination: 300h

Learning type
Lecture
Exercise course
Tutorial

3 Courses

T 3.1 Course: Advanced Mathematics I [T-MATH-100275]

Responsible: PD Dr. Tilo Arens
Prof. Dr. Roland Griesmaier
PD Dr. Frank Hettlich

Organisation: KIT Department of Mathematics

Part of: M-MACH-104624 - Orientierungsprüfung
M-MATH-102859 - Höhere Mathematik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	7	Each term	2

Events					
WS 18/19	0131000	Höhere Mathematik I für die Fachrichtung Maschinenbau, Geodäsie, Materialwissenschaft und Werkstofftechnik	4 SWS	Lecture (V)	Hettlich
WS 18/19	0131200	Höhere Mathematik I für die Fachrichtungen Chemieingenieurwesen, Verfahrenstechnik, Bioingenieurwesen und MIT	4 SWS	Lecture (V)	Hettlich
Exams					
SS 2018	6700025	Advanced Mathematics I		Prüfung (PR)	Hettlich, Kirsch, Arens
SS 2018	6700031	Advanced Mathematics I (English Class)		Prüfung (PR)	Arens, Aksenovich, Kirsch
WS 18/19	6700007	Advanced Mathematics I		Prüfung (PR)	Arens, Hettlich, Kirsch

Competence Certificate
Learning assessment is carried out by written examination of 120 minutes length.

Prerequisites
A "pass" result on the pre-requesite in AM I is a requirement for registration for the examination in AM I.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MATH-100525 - Tutorial Advanced Mathematics I must have been passed.

T 3.2 Course: Advanced Mathematics II [T-MATH-100276]

Responsible: PD Dr. Tilo Arens
Prof. Dr. Roland Griesmaier
PD Dr. Frank Hettlich

Organisation: KIT Department of Mathematics

Part of: M-MATH-102859 - Höhere Mathematik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	7	Each term	2

Events					
SS 2018	0120010	Advanced Mathematics II	4 SWS	Lecture (V)	Thäter
SS 2018	0180800	Höhere Mathematik II für die Fachrichtungen Maschinenbau, Geodäsie, Materialwissenschaft und Werkstofftechnik	4 SWS	Lecture (V)	Arens
SS 2018	0181000	Höhere Mathematik II für die Fachrichtungen Chemieingenieurwesen, Verfahrenstechnik, Bioingenieurwesen und MIT	4 SWS	Lecture (V)	Arens
Exams					
SS 2018	6700001	Advanced Mathematics II		Prüfung (PR)	Kirsch, Arens, Hettlich
SS 2018	6700032	Advanced Mathematics II (English Class)		Prüfung (PR)	Arens, Aksenovich, Kirsch
WS 18/19	6700008	Advanced Mathematics II		Prüfung (PR)	Arens, Kirsch, Hettlich

Competence Certificate
Learning assessment is carried out by written examination of 120 minutes length.

Prerequisites
A "pass" result on the pre-requesite in AM II is a requirement for registration for the examination in AM II.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MATH-100526 - Tutorial Advanced Mathematics II must have been passed.

T 3.3 Course: Advanced Mathematics III [T-MATH-100277]

Responsible: PD Dr. Tilo Arens
Prof. Dr. Roland Griesmaier
PD Dr. Frank Hettlich

Organisation: KIT Department of Mathematics

Part of: M-MATH-102859 - Höhere Mathematik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	7	Each term	2

Events					
WS 18/19	0131400	Höhere Mathematik III für die Fachrichtungen Maschinenbau, Chemieingenieurwesen, Verfahrenstechnik, Bioingenieurwesen und das Lehramt Maschinenbau	4 SWS	Lecture (V)	Kirsch
Exams					
SS 2018	6700002	Advanced Mathematics III		Prüfung (PR)	Arens, Kirsch, Hettlich
WS 18/19	6700009	Advanced Mathematics III		Prüfung (PR)	Arens, Hettlich, Kirsch

Competence Certificate
Learning assessment is carried out by written examination of 120 minutes length.

Prerequisites
A "pass" result on the pre-requesite in AM III is a requirement for registration for the examination in AM III.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MATH-100527 - Tutorial Advanced Mathematics III must have been passed.

T 3.4 Course: Advanced Methods in Strength of Materials [T-MACH-100296]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102582 - Schwerpunkt: Kontinuumsmechanik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	5	Each winter term	2

Events					
WS 18/19	2161252	Advanced Methods in Strength of Materials	2 SWS	Lecture (V)	Böhlke, Schneider
WS 18/19	2161985	Rechnerübungen zu Höhere Technische Festigkeitslehre	2 SWS	Practice (Ü)	Gajek
Exams					
SS 2018	76-T-MACH-100296	Advanced Methods in Strength of Materials		Prüfung (PR)	Böhlke, Langhoff
WS 18/19	76-T-MACH-100296	Advanced Methods in Strength of Materials		Prüfung (PR)	Böhlke

Competence Certificate
Written examination (90 min). Additives as announced

Prerequisites
None

Below you will find excerpts from events related to this course:

V Advanced Methods in Strength of Materials

Lecture (V)

2161252, WS 18/19, 2 SWS, Open in study portal

Learning Content

- kinematics
- mechanical balance laws
- theory of elasticity
- linear elastic fracture mechanics
- linear and plane structures
- elasto-plasticity theory

Workload
regular attendance: 21 hours
self-study: 99 hours

Literature
lecture notes

Gummert, P.; Reckling, K.-A.: Mechanik. Vieweg 1994.

Gross, D.; Seelig, T.: Bruchmechanik. Springer 2002.

Hibbeler, R.C: Technische Mechanik 2 - Festigkeitslehre. Pearson Studium 2005.

T 3.5 Course: Agile product innovation management - value-driven planning of new products [T-MACH-106744]

Responsible: Dr.-Ing. Roland Kläger
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	3

Events					
SS 2018	2122300	Agile product innovation management - value-driven planning of new products	SWS	Lecture (V)	Kläger
Exams					
SS 2018	76-T-MACH-106744	Agile product innovation management - value-driven planning of new products		Prüfung (PR)	Kläger
WS 18/19	76-T-MACH-106744	Agile product innovation management - value-driven planning of new products		Prüfung (PR)	Kläger

Competence Certificate
Oral examination, 20 min.

Prerequisites
None

T 3.6 Course: Alternative Powertrain for Automobiles [T-MACH-105655]

Responsible: Prof.Dipl.-Ing. Karl Ernst Noreikat
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102645 - Schwerpunkt: Technik des Verbrennungsmotors
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	1

Events					
WS 18/19	2133132	Alternative Powertrains for Automobiles	2 SWS	Lecture (V)	Noreikat
Exams					
SS 2018	76-T-MACH-105655	Alternative Powertrain for Automobiles		Prüfung (PR)	Noreikat
WS 18/19	76-T-MACH-105655	Alternative Powertrain for Automobiles		Prüfung (PR)	

Competence Certificate
written exam

T 3.7 Course: Analysis of Exhaust Gas and Lubricating Oil in Combustion Engines [T-MACH-105173]

Responsible: Dr.-Ing. Marcus Gohl
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102645 - Schwerpunkt: Technik des Verbrennungsmotors

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2134150	Analysis of Exhaust Gas und Lubricating Oil in Combustion Engines	2 SWS	Lecture (V)	Gohl
Exams					
SS 2018	76--T-Mach-105173	Analysis of Exhaust Gas and Lubricating Oil in Combustion Engines		Prüfung (PR)	Gohl
SS 2018	76-T-MACH-105173	Analysis of Exhaust Gas and Lubricating Oil in Combustion Engines		Prüfung (PR)	Koch
SS 2018	76-T-Mach-2134150	Analysis of Exhaust Gas and Lubricating Oil in Combustion Engines		Prüfung (PR)	Gohl
WS 18/19	76-T-MACH-105173	Analysis of Exhaust Gas and Lubricating Oil in Combustion Engines		Prüfung (PR)	Koch

Competence Certificate
Letter of attendance or oral exam (25 minutes, no auxillary means)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Analysis of Exhaust Gas und Lubricating Oil in Combustion Engines
2134150, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Lecture with Powerpoint slides

Learning Content
The students get involved in the application of different measurement techniques in the field of exhaust gas and lubricating oil analysis. The functional principles of the systems as well as the application areas of the latter are discussed. In addition to a general overview of standard applications, current specific development and research activities are introduced.

Workload
regular attendance: 24 hrs

self study: 96 hrs

Literature
The lecture documents are distributed during the courses.

T 3.8 Course: Applied Tribology in Industrial Product Development [T-MACH-105215]

Responsible: Prof. Dr.-Ing. Albert Albers
Dr.-Ing. Benoit Lorentz

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	2

Events					
WS 18/19	2145181	Applied Tribology in Industrial Product Development	2 SWS	Lecture (V)	Lorentz
Exams					
SS 2018	76-T-MACH-105215	Applied Tribology in Industrial Product Development		Prüfung (PR)	Albers
WS 18/19	76-T-MACH-105215	Applied Tribology in Industrial Product Development		Prüfung (PR)	Albers

Competence Certificate
oral exam (20 min)

Prerequisites
None

Below you will find excerpts from events related to this course:

V Applied Tribology in Industrial Product Development

2145181, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Friction, Wear, Wear Measurement

Lubricant (Oil, Grease, etc.)

Hydrodynamic and elastohydrodynamic Lubrication

Design of Tribologic Working Surface Pairs

Technique of Measurement in Lubricated Contacts

Prevention of Maschine Failure

Protective Surface Layers

Journal Bearings, Roller Bearings

Gear Wheels and Transmissions

Workload
regular attendance: 21 h

self-study: 99 h

Literature
The lecture script will be allocated at Ilias.

T 3.9 Course: Atomistic Simulations and Molecular Dynamics [T-MACH-105308]

Responsible: Dr. Christian Brandl
Prof. Dr. Peter Gumbsch
Dr.-Ing. Johannes Schneider

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik
M-MACH-104430 - Schwerpunkt: Modellbildung und Simulation in der Dynamik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	2

Events					
SS 2018	2181740	Atomistic simulations and molecular dynamics	2 SWS	Lecture (V)	Brandl, Gumbsch
SS 2018	2181741	Lab for 'Atomistic simulations and molecular dynamics'	2 SWS	Practice (Ü)	Brandl, Gumbsch
Exams					
SS 2018	76-T-MACH-105308	Atomistic Simulations and Molecular Dynamics		Prüfung (PR)	Gumbsch
WS 18/19	76-T-MACH-105308	Atomistic Simulations and Molecular Dynamics		Prüfung (PR)	Gumbsch

Competence Certificate
oral exam ca. 30 minutes

Prerequisites
none

Recommendation
preliminary knowlegde in mathematics, physics and materials science

Below you will find excerpts from events related to this course:

V Atomistic simulations and molecular dynamics

2181740, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Notes
Lecture in English!

Learning Content
The lecture introduces the foundation of particle based simulation methods focussing on molecular dynamics:

1. Introduction
2. Physics of Materials
3. MD Basics, Atom-Billard
* particle, position, energy, forces, pair potentials
* initial and boundary conditions
* time integration
4. algorithms
5. statics, dynamics, thermodynamics
6. MD output
7. interaction between particles
* pair potential -- many body potentials
* principles of quantum mechanics
* tight binding methods
* dissipative particle dynamics
8. application of particle based methods

Exercises (2181741, 2 SWS) are used for complementing and deepening the contents of the lecture as well as for answering more extensive questions raised by the students.

Workload
regular attendance: 22,5 hours
exercise: 22,5 hours
self-study: 75 hours

Literature

1. Understanding Molecular Simulation: From Algorithms to Applications, Daan Frenkel and Berend Smit (Academic Press, 2001)
2. Computer simulation of liquids, M. P. Allen and Dominic J. Tildesley (Clarendon Press, Oxford, 1996)

V **Lab for 'Atomistic simulations and molecular dynamics'** **Practice (Ü)**
2181741, SS 2018, 2 SWS, Open in study portal

Learning Content
Introduction to the basic usage of the MD software package IMD:

* generating initial structures
* energy calculations
* defects in lattices
* visualization of MD structures

Workload
see lecture

Literature
see lecture

T 3.10 Course: Automated Manufacturing Systems [T-MACH-102162]

Responsible: Prof. Dr.-Ing. Jürgen Fleischer
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102589 - Schwerpunkt: Produktionssysteme

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	9	Each summer term	2

Events					
SS 2018	2150904	Automated Manufacturing Systems	6 SWS	Lecture / Practice (VÜ)	Fleischer
Exams					
SS 2018	76-T-MACH-102162	Automated Manufacturing Systems		Prüfung (PR)	Fleischer
SS 2018	76-T-MACH-102162-MIT	Automated Manufacturing Systems		Prüfung (PR)	Fleischer
WS 18/19	76-T-MACH-102162	Automated Manufacturing Systems		Prüfung (PR)	Fleischer
WS 18/19	76-T-MACH-102162-MIT	Automated Manufacturing Systems		Prüfung (PR)	Fleischer

Competence Certificate
written exam (120 minutes)

Prerequisites
"T-MACH-108844 - Automatisierte Produktionsanlagen" must not be commenced.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-108844 - Automated Manufacturing Systems must not have been started.

Below you will find excerpts from events related to this course:

V Automated Manufacturing Systems
2150904, SS 2018, 6 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:
Lecture notes will be provided in Ilias (https://ilias.studium.kit.edu/)

Learning Content
The lecture provides an overview of the structure and functioning of automated manufacturing systems. In the introduction chapter the basic elements for the realization of automated manufacturing systems are given. This includes:

- Drive and control technology
- Handling technology for handling work pieces and tools
- Industrial Robotics
- Quality assurance in automated manufacturing
- automatic machines, cells, centers and systems for manufacturing and assembly
- structures of multi-machine systems
- planning of automated manufacturing systems

An interdisciplinary view of these subareas enables Industry 4.0 solutions.
In the second part of the lecture, the basics are illustrated using implemented manufacturing processes for the production of automotive components (chassis and drive technology).The analysis of automated manufacturing systems for manufacturing of defined components is also included.
In the field of vehicle power train both, the automated manufacturing process for the production of the conventional internal-combustion engine and the automated manufacturing process for the production of the prospective electric power train
(electric motor and battery) are considered. In the field of car body, the focus is on the analysis of the process chain for the automated manufacturing of conventional sheet metal body parts, as well as for automated manufacturing of body components made out of
fiber-reinforced plastics.
Within tutorials, the contents from the lecture are advanced and
applied to specific problems and tasks.

Annotation
None

Workload
MACH:
regular attendance: 63 hours
self-study: 177 hours
WING/TVWL:
regular attendance: 63 hours
self-study: 207 hours

Literature
Lecture Notes

T 3.11 Course: Automated Manufacturing Systems [T-MACH-108844]

Responsible: Prof. Dr.-Ing. Jürgen Fleischer
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-102820 - Schwerpunkt: Mechatronik
M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	8	Each summer term	1

Events					
SS 2018	2150904	Automated Manufacturing Systems	6 SWS	Lecture / Practice (VÜ)	Fleischer
Exams					
WS 18/19	76-T-MACH-108844	Automated Manufacturing Systems		Prüfung (PR)	Fleischer

Competence Certificate
oral exam (40 minutes)

Prerequisites
"T-MACH-102162 - Automatisierte Produktionsanlagen" must not be commenced.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-102162 - Automated Manufacturing Systems must not have been started.

Below you will find excerpts from events related to this course:

V Automated Manufacturing Systems

2150904, SS 2018, 6 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:
Lecture notes will be provided in Ilias (https://ilias.studium.kit.edu/)

Learning Content
The lecture provides an overview of the structure and functioning of automated manufacturing systems. In the introduction chapter the basic elements for the realization of automated manufacturing systems are given. This includes:

- Drive and control technology
- Handling technology for handling work pieces and tools
- Industrial Robotics
- Quality assurance in automated manufacturing
- automatic machines, cells, centers and systems for manufacturing and assembly
- structures of multi-machine systems
- planning of automated manufacturing systems

An interdisciplinary view of these subareas enables Industry 4.0 solutions.
In the second part of the lecture, the basics are illustrated using implemented manufacturing processes for the production of automotive components (chassis and drive technology).The analysis of automated manufacturing systems for manufacturing of defined components is also included.
In the field of vehicle power train both, the automated manufacturing process for the production of the conventional internal-combustion engine and the automated manufacturing process for the production of the prospective electric power train
(electric motor and battery) are considered. In the field of car body, the focus is on the analysis of the process chain for the automated manufacturing of conventional sheet metal body parts, as well as for automated manufacturing of body components made out of
fiber-reinforced plastics.
Within tutorials, the contents from the lecture are advanced and
applied to specific problems and tasks.

Annotation
None

Workload
MACH:
regular attendance: 63 hours
self-study: 177 hours
WING/TVWL:
regular attendance: 63 hours
self-study: 207 hours

Literature
Lecture Notes

T 3.12 Course: Automated Production Systems (MEI) [T-MACH-106732]

Responsible: Prof. Dr.-Ing. Jürgen Fleischer
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102644 - Schwerpunkt: Production Engineering

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	3150012	Automated Production Systems (MEI)	2 SWS	Lecture (V)	Fleischer
Exams					
WS 18/19	76-T-MACH-106732	Automated Production Systems (MEI)		Prüfung (PR)	Fleischer

Competence Certificate
oral exam (20 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Automated Production Systems (MEI)
3150012, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
The lecture provides an overview of the structure and functioning of automated production systems. In the introduction chapter the basic elements for the realization of automated production systems are given. This includes:

- Drive and control technology
- Handling technology for handling work pieces and tools
- Industrial Robotics
- automatic machines, cells, centers and systems for manufacturing and assembly
- planning of automated manufacturing systems

In the second part of the lecture, the basics are illustrated using implemented manufacturing processes for the production of automotive components. The analysis of automated manufacturing systems for manufacturing of defined components is also included.

T 3.13 Course: Automation Systems [T-MACH-105217]

Responsible: Prof. Dr.-Ing. Michael Kaufmann
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	2

Events					
SS 2018	2106005	Automation Systems	2 SWS	Lecture (V)	Kaufmann
Exams					
SS 2018	76-T-MACH-105217	Automation Systems		Prüfung (PR)	Kaufmann, Hagenmeyer
WS 18/19	76-T-MACH-105217	Automation Systems		Prüfung (PR)	Kaufmann, Hagenmeyer

Competence Certificate
Written exam (Duration: 1 h)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Automation Systems
2106005, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content

- Introduction: Terms and definitions, examples, requirements
- Industrial processes: classification, process conditions
- Automation tasks
- Components of industrial automation systems: control functions, data acquisition, data output equipment, Programmable Logic Controllers, PC-based control
- Industrial communication, classification, topology, protocols, bus systems for automation systems
- Engineering: plant engineering, composition of control systems, programming
- Requirements on equipment, documentation, identification
- Dependability and safety
- Diagnosis
- Application examples

Workload
general attendance: 21 h

self-study: 99 h

Literature

- Gevatter, H.-J., Grünhaupt, U.: Handbuch der Mess- und Regelungstechnik in der Produktion. 2. Auflage, Berlin, Heidelberg: Springer-Verlag, 2006.
- Langmann, R.: Taschenbuch der Automatisierung. München: Fachbuchverlag Leipzig, 2010.
- Strohrmann, G.: Automatisierung verfahrenstechnischer Prozesse: eine Einführung für Ingenieure und Techniker. München, Wien: Oldenbourg-Industrieverlag, 2002.
- Wellenreuther, G., Zastrow, D.: Automatisieren mit SPS: Theorie und Praxis. 4. Auflage, Wiesbaden: Vieweg+Teubner, 2009.

T 3.14 Course: Automotive Engineering I [T-MACH-100092]

Responsible: Prof. Dr. Frank Gauterin
Dr.-Ing. Hans-Joachim Unrau

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Expansion	Language	Version
Prüfungsleistung schriftlich	8	Each winter term	1 terms		2

Events					
WS 18/19	2113805	Automotive Engineering I	4 SWS	Lecture (V)	Gauterin, Unrau
WS 18/19	2113809	Automotive Engineering I	4 SWS	Lecture (V)	Gauterin, Gießler
Exams					
SS 2018	76-T-MACH-100092	Automotive Engineering		Prüfung (PR)	Gauterin, Unrau
WS 18/19	76-T-MACH-100092	Automotive Engineering		Prüfung (PR)	Unrau, Gauterin

Competence Certificate
Written examination

Duration: 120 minutes

Auxiliary means: none

Prerequisites
The brick "T-MACH-102203 - Automotive Engineering I" is not started or finished. The bricks "T-MACH-100092 - Grundlagen der Fahrzeugtechnik I" and "T-MACH-102203 - Automotive Engineering I" can not be combined.

Below you will find excerpts from events related to this course:

V Automotive Engineering I

2113805, WS 18/19, 4 SWS, Open in study portal **Lecture (V)**

Learning Content
1. History and future of the automobile

2. Driving mechanics: driving resistances and driving performance, mechanics of longitudinal and lateral forces, active and passive safety

3. Drive systems: combustion engine, hybrid and electric drive systems

4. Transmission: clutches (e.g. friction clutch, visco clutch), transmission (e.g. mechanical transmission, hydraulic fluid transmission)

5. Power transmission and distribution: drive shafts, cardon joints, differentials

Workload
regular attendance: 45 hours
self-study: 195 hours

Literature
1. Mitschke, M. / Wallentowitz, H.: Dynamik der Kraftfahrzeuge, Springer Vieweg, Wiesbaden 2014

2. Pischinger, S. / Seiffert, U.: Handbuch Kraftfahrzeugtechnik, Springer Vieweg, Wiesbaden 2016

3. Gauterin, F. / Unrau, H.-J. / Gnadler, R.: Script to the lecture 'Grundlagen der Fahrzeugtechnik I', KIT, Institute of Vehicle System Technology, Karlsruhe, annual update

V

Automotive Engineering I

2113809, WS 18/19, 4 SWS, Open in study portal

Lecture (V)

Notes
In English language.

Learning Content
1. History and future of the automobile

2. Driving mechanics: driving resistances and driving performances, mechanics of longitudinal and lateral forces, active and passive safety

3. Drive systems: combustion engine, hybrid and electric drive systems

4. Transmission: clutches (e.g. friction clutch, visco clutch), transmission (e.g. mechanical transmission, hydraulic fluid transmission)

5.Power transmission and distribution: drive shafts, cardon joints, differentials

Workload
regular attendance: 45 hours
self-study: 195 hours

Literature
1. Robert Bosch GmbH: Automotive Handbook, 9th edition, Wiley, Chichister 2015

2. Onori, S. / Serrao, L: / Rizzoni, G.: Hybrid Electric Vehicles - Energy Management Strategies, Springer London, Heidelberg, New York, Dordrecht 2016

3. Reif, K.: Brakes, Brake Control and Driver Assistance Systems - Function, Regulation and Components, Springer Vieweg, Wiesbaden 2015

4. Gauterin, F. / Gießler, M. / Gnadler, R.: Script to the lecture 'Automotive Engineering I', KIT, Institute of Vehicle System Technology, Karlsruhe, annual update

T 3.15 Course: Automotive Engineering II [T-MACH-102117]

Responsible: Prof. Dr. Frank Gauterin
Dr.-Ing. Hans-Joachim Unrau

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	1

Events					
SS 2018	2114835	Automotive Engineering II	2 SWS	Lecture (V)	Unrau
SS 2018	2114855	Automotive Engineering II	2 SWS	Lecture (V)	Gießler
Exams					
SS 2018	76-T-MACH-102117	Automotive Engineering II		Prüfung (PR)	Unrau, Gauterin
WS 18/19	76-T-MACH-102117	Automotive Engineering II		Prüfung (PR)	Unrau, Gauterin
WS 18/19	76T-MACH-102117-2	Automotive Engineering II		Prüfung (PR)	Gauterin, Unrau

Competence Certificate
Written Examination

Duration: 90 minutes

Auxiliary means: none

Prerequisites
none

Below you will find excerpts from events related to this course:

V Automotive Engineering II
2114835, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. Chassis: Wheel suspensions (rear axles, front axles, kinematics of axles), tyres, springs, damping devices
2. Steering elements: Manual steering, servo steering, steer by wire
3. Brakes: Disc brake, drum brake, comparison of designs

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature
1. Heißing, B. / Ersoy, M.: Fahrwerkhandbuch: Grundlagen, Fahrdynamik, Komponenten, Systeme, Mechatronik, Perspektiven, Springer Vieweg, Wiesbaden, 2013

2. Breuer, B. / Bill, K.-H.: Bremsenhandbuch: Grundlagen - Komponenten - Systeme - Fahrdynamik, Springer Vieweg, Wiesbaden, 2017

3. Gnadler, R. / Unrau, H.-J.: Script to the lecture 'Grundlagen der Fahrzeugtechnik II'

V Automotive Engineering II
2114855, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content

1. Chassis: Wheel suspensions (rear axles, front axles, kinematics of axles), tyres, springs, damping devices
2. Steering elements: Steering elements of single vehicles and of trailers
3. Brakes: Disc brake, drum brake, retarder, comparison of the designs

Literature
Elective literature:

1. Reimpell, J.: Fahrwerktechnik: Grundlagen, Vogel Verlag, 1995
2. Burckhardt, M.: Bremsdynamik und Pkw-Bremsanlagen, Vogel Verlag, 1991
3. Gnadler, R.: Skript zur Vorlesung "Grundlagen der Fahrzeugtechnik II"

T 3.16 Course: Automotive Logistics [T-MACH-105165]

Responsible: Prof. Dr.-Ing. Kai Furmans
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102589 - Schwerpunkt: Produktionssysteme

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	1

Events					
SS 2018	2118085	Automotive Logistics	2 SWS	Lecture (V)	Furmans
Exams					
SS 2018	76-T-MACH-105165	Automotive Logistics		Prüfung (PR)	Mittwollen, Furmans
WS 18/19	76-T-MACH-105165	Automotive Logistics		Prüfung (PR)	Furmans, Mittwollen

Competence Certificate
The assessment consists of a 60 minutes written examination (according to §4(2), 1 of the examination regulation).

Prerequisites
none

Below you will find excerpts from events related to this course:

V Automotive Logistics
2118085, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:
presentations, black board

Learning Content

- Logistic questions within the automobile industry
- basic model of automobile production and distribution
- relation with the suppliers
- Disposition and physical execution
- Vehicle production in the interaction of shell, paint shop and assembly
- Sequence planning
- Assembly supply
- vehicle distribution and linkage with selling processes
- Physical execution, planning and control

Annotation
none

Workload
regular attendance: 21 hours
self-study: 99 hours

Literature
None.

T 3.17 Course: Automotive Vision [T-MACH-105218]

Responsible: Dr. Martin Lauer
Prof. Dr.-Ing. Christoph Stiller

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102638 - Schwerpunkt: Bahnsystemtechnik
M-MACH-102817 - Schwerpunkt: Informationstechnik
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	6	Each summer term	1

Events					
SS 2018	2138340	Automotive Vision	3 SWS	Lecture (V)	Lauer
Exams					
SS 2018	76-T-MACH-105218	Automotive Vision		Prüfung (PR)	Stiller, Lauer
WS 18/19	76-T-MACH-105218	Automotive Vision		Prüfung (PR)	Stiller, Lauer

Competence Certificate
Type of Examination: written exam

Duration of Examination: 60 minutes

Prerequisites
none

Below you will find excerpts from events related to this course:

V Automotive Vision
2138340, SS 2018, 3 SWS, Open in study portal

Lecture (V)

Learning Content
1. Driver assistance systems
2. Binocular vision
3. Feature point methods
4. Optical flow/tracking in images
5. Tracking and state estimation
6. Self-localization and mapping
7. Lane recognition
8. Behavior recognition

Workload
120 hours

Literature
TBA

T 3.18 Course: Bachelor Thesis [T-MACH-109188]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-104494 - Bachelorarbeit

Type	Credits	Recurrence	Version
Abschlussarbeit	12	Each term	1

Exams				
WS 18/19	76-T-MACH-109188	Bachelor Thesis	Prüfung (PR)	

Competence Certificate
The bachelor thesis is designed to show that the student is able to deal with a problem of his/her subject area in an independent manner and within the given period of time using scientific methods.

The work load of the bachelor thesis corresponds to 12 ECTS. The maximal processing time of the bachelor thesis takes three months. The date of issue of the subject has to be fixed by the supervisor and the student and to be put on record at the examination board. The subject of the bachelor thesis may be only returned once and only within the first month of processing time.

On a reasoned request of the student, the examination board can extend the processing time by up to one month. If the bachelor thesis is not completed in time, this examination is "failed" (5,0), unless the student is not responsible.

The bachelor thesis is to be evaluated by not less than a professor or a senior scientist according to § 14 Abs. 3 Ziff. 1 KITG and another examiner. Generally, one of the two examiners is the person who has assigned the thesis. If the examiners do not agree, the bachelor thesis is graded by the examination board within this assessment; another expert can be appointed too. The bachelor thesis has to be graded within a period of six weeks after the submission.

Prerequisites
The requirement for admission to the bachelor thesis module are 120 ECTS. As to exceptions, the examination board decides on a request of the student (see § 14 (1) SPO).

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to earn at least 120 credits in the following fields:
    - Fundamentals of Engineering
    - Interdisciplinary Qualifications
    - Specialization in Mechanical Engineering

Annotation
The workload for the preparation of the bachelor thesis is about 360 hours.

T 3.19 Course: Basics in Measurement and Control Systems [T-MACH-104745]

Responsible: Prof. Dr.-Ing. Christoph Stiller
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102564 - Mess- und Regelungstechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	7	Each winter term	2

Events					
WS 18/19	2137301	Measurement and Control Systems	3 SWS	Lecture (V)	Stiller
WS 18/19	2137302	Measurement and Control Systems (Tutorial)	1 SWS	Practice (Ü)	Stiller, Janosovits, Wirth
WS 18/19	3137020	Measurement and Control Systems	3 SWS	Lecture (V)	Stiller
WS 18/19	3137021	Measurement and Control Systems (Tutorial)	1 SWS	Practice (Ü)	Stiller, Janosovits, Wirth
Exams					
SS 2018	76-T-MACH-104745	Basis of Measurement and Control Systems		Prüfung (PR)	Stiller
WS 18/19	76-T-MACH-104745	Basis of Measurement and Control Systems		Prüfung (PR)	Stiller

Competence Certificate
written exam

2,5 hours

Prerequisites
none

Below you will find excerpts from events related to this course:

V Measurement and Control Systems
2137301, WS 18/19, 3 SWS, Open in study portal

Lecture (V)

Learning Content
1 Dynamic systems
2 Properties of important systems and modeling
3 Transfer characteristics and stability
4 Controller design
5 Fundamentals of measurement
6 Estimation
7 Sensors
8 Introduction to digital measurement

Workload
210 hours

Literature

- Measurement and Control Systems:

R.H. Cannon: Dynamics of Physical Systems, McGraw-Hill Book Comp., New York,1967
G.F. Franklin: Feedback Control of Dynamic Systems, Addison-Wesley Publishing Company, USA, 1988
R. Dorf and R. Bishop: Modern Control Systems, Addison-Wesley
C. Phillips and R. Harbor: Feedback Control Systems, Prentice-Hall

- Regelungstechnische Bücher:

J. Lunze: Regelungstechnik 1 & 2, Springer-Verlag
R. Unbehauen: Regelungstechnik 1 & 2, Vieweg-Verlag
O. Föllinger: Regelungstechnik, Hüthig-Verlag
W. Leonhard: Einführung in die Regelungstechnik, Teubner-Verlag
Schmidt, G.: Grundlagen der Regelungstechnik, Springer-Verlag, 2. Aufl., 1989

- Messtechnische Bücher:

E. Schrüfer: Elektrische Meßtechnik, Hanser-Verlag, München, 5. Aufl., 1992
U. Kiencke, H. Kronmüller, R. Eger: Meßtechnik, Springer-Verlag, 5. Aufl., 2001
H.-R. Tränkler: Taschenbuch der Messtechnik, Verlag Oldenbourg München, 1996
W. Pfeiffer: Elektrische Messtechnik, VDE Verlag Berlin 1999
Kronmüller, H.: Prinzipien der Prozeßmeßtechnik 2, Schnäcker-Verlag, Karlsruhe, 1. Aufl., 1980

V Measurement and Control Systems

3137020, WS 18/19, 3 SWS, Open in study portal

Lecture (V)

Learning Content

1. 1 Dynamic systems
   2 Properties of important systems and modeling
   3 Transfer characteristics and stability
   4 Controller design
   5 Fundamentals of measurement
   6 Estimation
   7 Sensors
   8 Introduction to digital measurement

Workload
180 hours

Literature

- Measurement and Control Systems:

R.H. Cannon: Dynamics of Physical Systems, McGraw-Hill Book Comp., New York,1967
G.F. Franklin: Feedback Control of Dynamic Systems, Addison-Wesley Publishing Company, USA, 1988
R. Dorf and R. Bishop: Modern Control Systems, Addison-Wesley
C. Phillips and R. Harbor: Feedback Control Systems, Prentice-Hall

- Regelungstechnische Bücher:

J. Lunze: Regelungstechnik 1 & 2, Springer-Verlag
R. Unbehauen: Regelungstechnik 1 & 2, Vieweg-Verlag
O. Föllinger: Regelungstechnik, Hüthig-Verlag
W. Leonhard: Einführung in die Regelungstechnik, Teubner-Verlag
Schmidt, G.: Grundlagen der Regelungstechnik, Springer-Verlag, 2. Aufl., 1989

- Messtechnische Bücher:

E. Schrüfer: Elektrische Meßtechnik, Hanser-Verlag, München, 5. Aufl., 1992
U. Kiencke, H. Kronmüller, R. Eger: Meßtechnik, Springer-Verlag, 5. Aufl., 2001
H.-R. Tränkler: Taschenbuch der Messtechnik, Verlag Oldenbourg München, 1996
W. Pfeiffer: Elektrische Messtechnik, VDE Verlag Berlin 1999
Kronmüller, H.: Prinzipien der Prozeßmeßtechnik 2, Schnäcker-Verlag, Karlsruhe, 1. Aufl., 1980

T 3.20 Course: Basics of Manufacturing Technology [T-MACH-105219]

Responsible: Prof. Dr.-Ing. Volker Schulze
Dr.-Ing. Frederik Zanger

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102549 - Fertigungsprozesse

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	1

Events					
WS 18/19	2149658	Basics of Manufacturing Technology	2 SWS	Lecture / Practice (VÜ)	Schulze, Zanger
Exams					
SS 2018	76-T-MACH-105219	Basics of Manufacturing Technology		Prüfung (PR)	Schulze
WS 18/19	76-T-MACH-105219	Fundamentals of Manufacturing Technology		Prüfung (PR)	Schulze

Competence Certificate
written exam (duration: 60 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Basics of Manufacturing Technology

2149658, WS 18/19, 2 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

Lecture notes will be provided in ilias (https://ilias.studium.kit.edu/).

Learning Content
The objective of the lecture is to classify the manufacturing technology within the wider context of production engineering, to provide an overview of the different manufacturing processes and to establish basic process knowledge of the common processes. The lecture conveys the basic principles of manufacturing technology and deals with the manufacturing processes based on example components according to their classification into main groups regarding technical and economic aspects. Regard is paid to classic manufacturing processes as well as new developments like additive manufacturing processes. The following topics will be covered:

- Primary processing (casting, plastics engineering, sintering, additive manufacturing processes)
- Forming (sheet-metal forming, massive forming)
- Cutting (machining with geometrically defined and geometrically undefined cutting edges, separating, abrading)
- Joining
- Coating
- Heat treatment and surface treatment

Workload
regular attendance: 21 hours
self-study: 99 hours

T 3.21 Course: Basics of Technical Logistics [T-MACH-102163]

Responsible: Dr.-Ing. Martin Mittwollen
Jan Oellerich

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul
M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	6	Each winter term	2

Events					
WS 18/19	2117095	Basics of Technical Logistics	4 SWS	Lecture / Practice (VÜ)	Mittwollen, Oellerich
Exams					
SS 2018	76-T-MACH-102163	Basics of Technical Logistics		Prüfung (PR)	Mittwollen
WS 18/19	76-T-MACH-102163	Basics of Technical Logistics		Prüfung (PR)	Mittwollen

Competence Certificate
The assessment consists of a written exam (90 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Basics of Technical Logistics

2117095, WS 18/19, 4 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

supplementary sheets,presentations, blackboard

Notes
lectures and practice; practice dates: look up ILIAS

Learning Content

- effect model of conveyor machines
- elements for the change of position and orientation
- conveyor processes
- identification systems
- drives
- mechanical behaviour of conveyors
- structure and function of conveyor machines
- elements of intralogistics
- sample applications and calculations in addition to the lectures inside practical lectures

Annotation
Basics knowledge of technical mechanics is preconditioned

Workload
presence: 48h

rework: 132h

Literature
Recommendations during lessons

T 3.22 Course: Behaviour Generation for Vehicles [T-MACH-105367]

Responsible: Prof. Dr.-Ing. Christoph Stiller
Dr. Moritz Werling

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102817 - Schwerpunkt: Informationstechnik
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-102820 - Schwerpunkt: Mechatronik
M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	1

Events					
SS 2018	2138336	Behaviour Generation for Vehicles	2 SWS	Lecture (V)	Werling, Stiller
Exams					
SS 2018	76-T-MACH-105367	Behaviour Generation for Vehicles		Prüfung (PR)	Stiller
WS 18/19	76-T-MACH-105367	Behaviour Generation for Vehicles		Prüfung (PR)	Stiller

Competence Certificate
written examination

60 min.

Simple calculators are allowed, programmable or graphical ones are prohibited.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Behaviour Generation for Vehicles

2138336, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. Driver assistance systems
2. Driving comfort and safety
3. Vehicle dynamics
4. Path and trajectory planning
5. Path control
6. Collision avoidance

Workload
120 hours

Literature
TBA

T 3.23 Course: Biomechanics: design in nature and inspired by nature [T-MACH-105651]

Responsible: Prof. Dr. Claus Mattheck
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Studienleistung	4	Each winter term	1

Events					
WS 18/19	2181708	Biomechanics: Design in Nature and Inspired by Nature	3 SWS	Seminar / Practical course (S/P)	Mattheck
Exams					
SS 2018	76-T-MACH-105651	Biomechanics: design in nature and inspired by nature		Prüfung (PR)	Schwarz
WS 18/19	76-T-MACH-105651	Biomechanics: design in nature and inspired by nature		Prüfung (PR)	Mattheck

Competence Certificate
Colloquium, ungraded.

Prerequisites
The number of participants is limited. Prior registration through ILIAS is necessary, In case of too many registrations, a selection (in accordance with SPO) will take place.
Before the registration in SP 26 (ME) or SP 01 (MSMT) the participation at the seminar must be confirmed.

Below you will find excerpts from events related to this course:

V Biomechanics: Design in Nature and Inspired by Nature
2181708, WS 18/19, 3 SWS, Open in study portal

Seminar / Practical course (S/P)

Notes
22.10.2018: Biomechanics is already fully booked in WS 18/19, further registrations are not possible

The number of participants is limited.

Learning Content
* mechanics and growth laws of trees
* failure criteria and safety factors
* computer simulation of adaptive growth
* notches and damage case studies
* optimization inspired by nature
* structural shape optimization without computers
* universal shapes of nature
* fibre reinforces materials
* failure of trees, hillsides, dikes, walls and pipes

Workload
regular attendance: 30 hours
self-study: 90 hours

T 3.24 Course: BUS-Controls [T-MACH-102150]

Responsible: Simon Becker
Prof. Dr.-Ing. Marcus Geimer

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102817 - Schwerpunkt: Informationstechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	2

Events					
SS 2018	2114092	BUS-Controls	2 SWS	Lecture (V)	Geimer, Daiß, Becker
Exams					
SS 2018	76T-MACH-102150	BUS-Controls		Prüfung (PR)	Geimer
SS 2018	76-T-MACH-102150	BUS-Controls		Prüfung (PR)	Geimer
WS 18/19	76T-MACH-102150	BUS-Controls		Prüfung (PR)	Geimer
WS 18/19	76-T-MACH-102150	BUS-Controls		Prüfung (PR)	Geimer

Competence Certificate
The assessment consists of an oral exam (20 min) taking place in the recess period. The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Prerequisites
Required for the participation in the examination is the preparation of a report during the semester. The partial service with the code T-MACH-108889 must have been passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-108889 - BUS-Controls - Advance must have been passed.

Recommendation
Basic knowledge of electrical engineering is recommended. Programming skills are also helpful.

The number of participants is limited. A registration in mandatory, the details will be announced on the webpages of the *Institute of Vehicle System Technology / Institute of Mobile Machines.* In case of too many applications, attendance will be granted based on pre-qualification.

Annotation
The students will get an overview of the theoretic and practical functioning of different bus systems.

After the practical oriented lessons the students will be able to visualize the communication structure of different applications, design basic systems and evaluate the complexity of programming of the complete system.
Hereunto the students program in the practical orientated lessons IFM-controllers using the programming environment CoDeSys.

Content:

- Knowledge of the basics of data communication in networks
- Overview of the operating mode of current field buses
- Explicit observation of the operating mode and application areas of CAN buses
- Practical programming of an example application (hardware is provided)

Literature:

- Etschberger, K.: Controller Area Network, Grundlagen, Protokolle, Bausteine, Anwendungen; München, Wien: Carl Hanser Verlag, 2002.
- Engels, H.: CAN-Bus - CAN-Bus-Technik einfach, anschaulich und praxisnah dargestellt; Poing: Franzis Verlag, 2002.

Below you will find excerpts from events related to this course:

V

BUS-Controls

2114092, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content

- Knowledge of the basics of data communication in networks
- Overview of the operating mode of current field buses
- Explicit observation of the operating mode and application areas of CAN buses
- Practical programming of an example application (hardware is provided)

Annotation
The course will be replenished by interesting lectures of professionals.

Workload

- regular attendance: 21 hours
- self-study: 92 hours

Literature
Elective literature:

- Etschberger, K.: Controller Area Network, Grundlagen, Protokolle, Bausteine, Anwendungen; München, Wien: Carl Hanser Verlag, 2002.
- Engels, H.: CAN-Bus - CAN-Bus-Technik einfach, anschaulich und praxisnah dargestellt; Poing: Franzis Verlag, 2002.

T 3.25 Course: BUS-Controls - Advance [T-MACH-108889]

Responsible: Kevin Daiß
Prof. Dr.-Ing. Marcus Geimer

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102817 - Schwerpunkt: Informationstechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Studienleistung	0	Each summer term	1

Exams				
WS 18/19	76-T-MACH-108889	BUS-Controls - Advance	Prüfung (PR)	Geimer

Competence Certificate
Creation of control program

Prerequisites
none

T 3.26 Course: CAD-NX Training Course [T-MACH-102187]

Responsible: Prof. Dr.-Ing. Jivka Ovtcharova
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement

Type	Credits	Recurrence	Version
Studienleistung praktisch	2	Each term	2

Events					
SS 2018	2123357	CAD-NX training course	3 SWS	Practical course (P)	Ovtcharova, Mitarbeiter
WS 18/19	2123357	CAD-NX training course	2 SWS	Practical course (P)	Ovtcharova, Mitarbeiter
Exams					
SS 2018	76-T-MACH-102187	CAD-NX Training Course		Prüfung (PR)	Ovtcharova
WS 18/19	76-T-MACH-102187	CAD-NX Training Course		Prüfung (PR)	Ovtcharova

Competence Certificate
Practical examination on CAD computer, duration: 60 min.

Prerequisites
None

Recommendation
Dealing with technical drawings is required.

Annotation
For the practical course compulsory attendance exists.

Below you will find excerpts from events related to this course:

V CAD-NX training course
2123357, SS 2018, 3 SWS, Open in study portal

Practical course (P)

Learning Content
The participant will learn the following knowledge:

- Overview of the functional range
- Introduction to the work environment of NX
- Basics of 3D-CAD modelling
- Feature-based modelling
- Freeform modelling
- Generation of technical drawings
- Assembly modelling
- Finite element method (FEM) and multi-body simulation (MBS) with NX

Annotation
For the practical course compulsory attendance exists.

Workload
Regular attendance: 35 hours,
Self-study: 12 hours

Literature
Practical course skript

V

CAD-NX training course

2123357, WS 18/19, 2 SWS, Open in study portal

Practical course (P)

Learning Content
The participant will learn the following knowledge:

- Overview of the functional range
- Introduction to the work environment of NX
- Basics of 3D-CAD modelling
- Feature-based modelling
- Freeform modelling
- Generation of technical drawings
- Assembly modelling
- Finite element method (FEM) and multi-body simulation (MBS) with NX

Annotation
For the practical course compulsory attendance exists.

Workload
Regular attendance: 35 hours,
Self-study: 12 hours

Literature
Practical course skript

T 3.27 Course: CAE-Workshop [T-MACH-105212]

Responsible: Prof. Dr.-Ing. Albert Albers
Organisation: KIT Department of Mechanical Engineering

Part of:
M-MACH-102582 - Schwerpunkt: Kontinuumsmechanik
M-MACH-102583 - Schwerpunkt: Informationsmanagement
M-MACH-102746 - Wahlpflichtmodul
M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each term	1

Events					
SS 2018	2147175	CAE-Workshop	3 SWS	Block (B)	Albers, Mitarbeiter
WS 18/19	2147175	CAE-Workshop	3 SWS	Block lecture (BV)	Albers, Mitarbeiter
Exams					
SS 2018	76-T-MACH-105212	CAE-Workshop		Prüfung (PR)	Albers
WS 18/19	76-T-MACH-105212	CAE-Workshop		Prüfung (PR)	Albers

Competence Certificate
Depending on the manner in which the CAE-Workshop will be credited.
optional compulsory subject: written-practical exam, duration 60 min

optional subject: written-practical exam, duration 45 min

complementary subject as part of the major field: written-practical exam, duration 45 min

Below you will find excerpts from events related to this course:

V CAE-Workshop

2147175, SS 2018, 3 SWS, Open in study portal

Block (B)

Learning Content
Content in the summer semester:

- introduction to the finite element analysis (FEA)
- stess and modal analysis of finite element models using Abaqus/CAE as a preprocessor and Abaqus solver
- introduction to topology and shape optimization
- creation and calculation of various optimization models with the optimization package TOSCA and the Abaqus solver

Content in the winter semester:

- introduction to the finite element analysis (FEA)
- stress and modal analysis of finite element models using Abaqus/CAE as a preprocessor and Abaqus solver
- introduction to multi-body simulation (MBS)
- preparation and running of multi-body simulation models. Coupling of the MBS and FEA to calculate hyprid multi-body simulation problems.

Workload
regular attendance: 31.5 h

self-study: 58 h

independent work with different software tools (supported by tutors and faculty stuff)

discussing and presenting results in small groups

Literature
The workshop script will be allocated at Ilias.

V

CAE-Workshop

2147175, WS 18/19, 3 SWS, Open in study portal

Block lecture (BV)

Learning Content
Content in the summer semester:

- introduction to the finite element analysis (FEA)
- stess and modal analysis of finite element models using Abaqus/CAE as a preprocessor and Abaqus solver
- introduction to topology and shape optimization
- creation and calculation of various optimization models with the optimization package TOSCA and the Abaqus solver

Content in the winter semester:

- introduction to the finite element analysis (FEA)
- stress and modal analysis of finite element models using Abaqus/CAE as a preprocessor and Abaqus solver
- introduction to multi-body simulation (MBS)
- preparation and running of multi-body simulation models. Coupling of the MBS and FEA to calculate hyprid multi-body simulation problems.

Workload
regular attendance: 31.5 h

self-study: 58 h

independent work with different software tools (supported by tutors and faculty stuff)

discussing and presenting results in small groups

Literature
The workshop script will be allocated at Ilias.

T 3.28 Course: CATIA CAD Training Course [T-MACH-102185]

Responsible: Prof. Dr.-Ing. Jivka Ovtcharova
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement

Type	Credits	Recurrence	Version
Studienleistung praktisch	2	Each term	2

Events					
SS 2018	2123358	CATIA CAD training course	3 SWS	Practical course (P)	Ovtcharova, Mitarbeiter
WS 18/19	2123358	CATIA CAD training course	2 SWS	Practical course (P)	Ovtcharova, Mitarbeiter
Exams					
SS 2018	76-T-MACH-102185	CATIA CAD Training Course		Prüfung (PR)	Ovtcharova
WS 18/19	76-T-MACH-102185	CATIA CAD Training Course		Prüfung (PR)	Ovtcharova

Competence Certificate
Practical examination on CAD computer, duration: 60 min.

Prerequisites
None

Recommendation
Dealing with technical drawings is required.

Annotation
For the practical course attendance is compulsory.

Below you will find excerpts from events related to this course:

V CATIA CAD training course

2123358, SS 2018, 3 SWS, Open in study portal

Practical course (P)

Learning Content
The participant will learn the following knowledge:

- Basics of CATIA such as user interface, handling etc.
- Production and processing of different model types
- Production of basic geometries and parts
- Generation of detailed drawings
- Integration of partial solutions in modules
- Working with constrains
- Strength analysis with FEM
- Kinematic simulation with DMU
- Dealing with CATIA Knowledgeware

Annotation
For the practical course attendance is compulsory.

Workload
Regular attendance: 35 hours,
self-study: 12 hours

Literature
practical course skript

V

CATIA CAD training course

2123358, WS 18/19, 2 SWS, Open in study portal

Practical course (P)

Learning Content
The participant will learn the following knowledge:

- Basics of CATIA such as user interface, handling etc.
- Production and processing of different model types
- Production of basic geometries and parts
- Generation of detailed drawings
- Integration of partial solutions in modules
- Working with constrains
- Strength analysis with FEM
- Kinematic simulation with DMU
- Dealing with CATIA Knowledgeware

Annotation
For the practical course attendance is compulsory.

Workload
Regular attendance: 35 hours,
self-study: 12 hours

Literature
practical course skript

T 3.29 Course: Cognitive Automobiles - Laboratory [T-MACH-105378]

Responsible: Bernd Kitt
Dr. Martin Lauer
Prof. Dr.-Ing. Christoph Stiller

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	6	Each summer term	1

Events					
SS 2018	2138341	Cogitive Automobiles - Laboratory	3 SWS	Practice (PÜ)	Stiller, Lauer, Wirges
Exams					
SS 2018	76-T-MACH-105378	Cognitive Automobiles - Laboratory		Prüfung (PR)	Stiller
WS 18/19	76-T-MACH-105378	Cognitive Automobiles - Laboratory		Prüfung (PR)	Stiller, Lauer

Competence Certificate
oral exam

30 minutes

Prerequisites
none

Annotation
The number of participants is limited. A registration is mandatory, the details are announced on the webpages of the institute of measurement and control systems (mrt). In case of too many interested students a subset will be selected (see website).

Below you will find excerpts from events related to this course:

V Cogitive Automobiles - Laboratory

2138341, SS 2018, 3 SWS, Open in study portal

Practice (PÜ)

Learning Content
1. Lane recognition
2. Object detection
3. Vehicle lateral control
4. Vehicle longitudinal control
5. Collision avoidance

Workload
120 hours

Literature
TBA

T 3.30 Course: Combustion Engines I [T-MACH-102194]

Responsible: Prof. Dr. Thomas Koch
Dr.-Ing. Heiko Kubach

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2133113	Combustion Engines I	4 SWS	Lecture / Practice (VÜ)	Koch
Exams					
SS 2018	76-T-MACH-102194	Combustion Engines I		Prüfung (PR)	Koch, Kubach
WS 18/19	76-T-MACH-102194	Combustion Engines I		Prüfung (PR)	Kubach, Koch

Competence Certificate
oral examination, Duration: 25 min., no auxiliary means

Prerequisites
none

Below you will find excerpts from events related to this course:

V Combustion Engines I

2133113, WS 18/19, 4 SWS, Open in study portal

Lecture / Practice (VÜ)

Learning Content
Introduction, History, Concepts
Working Principle and Termodynamics

Characteristic Parameters

Air Path

Fuel Path

Energy Conversion

Fuels

Emissions

Exhaust Gas Aftertreatment

Workload
regular attendance: 32 hours
self-study: 88 hours

T 3.31 Course: Composite Manufacturing - Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies [T-MACH-105535]

Responsible: Prof. Dr.-Ing. Frank Henning
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102638 - Schwerpunkt: Bahnsystemtechnik
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	2

Events					
SS 2018	2114053	Composite Manufacturing – Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies	2 SWS	Lecture (V)	Henning
Exams					
SS 2018	76-T-MACH-105535	Composite Manufacturing - Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies		Prüfung (PR)	Henning
WS 18/19	76-T-MACH-105535	Composite Manufacturing - Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies		Prüfung (PR)	Henning

Competence Certificate
written exam 90 minutes

Prerequisites
none

Below you will find excerpts from events related to this course:

V Composite Manufacturing – Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies

Lecture (V)

2114053, SS 2018, 2 SWS, Open in study portal

Learning Content
Physical connections of fiber reinforcement

Use and examples
automotive construction
transport
Energy and construction
sport and recreation

resins
thermoplastics
duromeres

mechanisms of reinforcements
glas fibers
carbon fibers
aramid fibers
natural fibers

semi-finished products - textiles

process technologies - prepregs

recycling of composites

Workload
lectures: 21h, preparation of examination: 79h

T 3.32 Course: Computational Dynamics [T-MACH-105349]

Responsible: Prof. Dr.-Ing. Carsten Proppe
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104430 - Schwerpunkt: Modellbildung und Simulation in der Dynamik
M-MACH-104442 - Schwerpunkt: Schwingungslehre

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2162246	Computational Dynamics	2 SWS	Event (Veranst.)	Proppe
Exams					
SS 2018	76-T-MACH-105349	Computational Dynamics		Prüfung (PR)	Proppe
WS 18/19	76-T-MACH-105349	Computational Dynamics		Prüfung (PR)	Proppe

Competence Certificate
oral exam, 30 min.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Computational Dynamics

2162246, SS 2018, 2 SWS, Open in study portal

Event (Veranst.)

Learning Content
1. Fundamentals of elasto-kinetics (Equations of motion, principle of Hamilton and principle of Hellinger-Reissner)
2. Differential equations for the vibration of structure elements (bars, plates)
3. Numerical solutions of the equations of motion
4. Numerical algorithms
5. Stability analyses

Annotation
The course takes place every two years (in pair years).

Workload
Lectures: 20 h

Self-studies: 100 h

Literature
1. Lecture notes (in German) will be provided!

2. M. Géradin, B. Rixen: Mechanical Vibrations, Wiley, Chichester, 1997

T 3.33 Course: Computational Homogenization on Digital Image Data [T-MACH-109302]

Responsible: Dr. rer. nat. Matti Schneider
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102582 - Schwerpunkt: Kontinuumsmechanik

Type	Credits	Recurrence	Expansion	Version
Prüfungsleistung mündlich	6	Each winter term	1 terms	1

Events					
WS 18/19	2161123	Computational homogenization on digital image data	2 SWS	Lecture (V)	Schneider
Exams					
WS 18/19	76-T-MACH-109302	Computational Homogenization on Digital Image Data		Prüfung (PR)	

Competence Certificate
oral exam, 30 min

Prerequisites
nein

Below you will find excerpts from events related to this course:

V Computational homogenization on digital image data

2161123, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Description
Contents of the lectures "Advanced Methods in Strength of Materials" or "Mathematical Methods in Strength of Materials" are required

Learning Content
Contents:
* basic equations for computing effective elastic material properties
* Moulinec-Suquet's FFT-based computational homogenization method
* schemes for treating highly contrasted/porous/defected media
* treating non-linear and time dependent mechanical proplems

Workload
regular attendance: 42 hours (together with tutorial No 2161124)
self-study: 138 hours

Literature
Milton, G. W.: The Theory of Composites. Springer, New York, 2002

T 3.34 Course: Computational Intelligence [T-MACH-105314]

Responsible: Dr. Wilfried Jakob
Prof. Dr. Ralf Mikut
PD Dr.-Ing. Markus Reischl

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102817 - Schwerpunkt: Informationstechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	1

Events					
WS 18/19	2105016	Computational Intelligence	2 SWS	Lecture (V)	Mikut, Jakob, Reischl
Exams					
SS 2018	76-T-MACH-105314	Computational Intelligence		Prüfung (PR)	Hagenmeyer
WS 18/19	76-T-MACH-105314	Computational Intelligence		Prüfung (PR)	Hagenmeyer

Competence Certificate
Written exam (Duration: 1h)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Computational Intelligence

2105016, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Description
The students are able to apply the fundamental methods of computational intelligence (fuzzy logic, artificial neural networks, evolutionary algorithms) efficiently. They know the basic mathematical foundations and are able to transfer these methods to practical applications.

Learning Content

- Terms and definitions Computational Intelligence, application fields and examples
- Fuzzy logic: fuzzy sets; fuzzification and membership functions; inference: T-norms and -conorms, operators, aggregation, activation, accumulation; defuzzification methods, structures for fuzzy control
- Artificial Neural Nets: biology of neurons, Multi-Layer-Perceptrons, Radial-Basis-Function nets, Kohonen maps, training strategies (Backpropagation, Levenberg-Marquardt)
- Evolutionary Algorithms: Basic algorithm, Genetic Algorithms and Evolution Strategies, Evolutionary Algorithm GLEAM, integration of local search strategies, memetic algorithms, application examples

Workload
regular attendance: 21 hours
self-study: 99 hours

Literature

Lecture notes (ILIAS)

Kiendl, H.: Fuzzy Control. Methodenorientiert. Oldenbourg-Verlag, München, 1997

S. Haykin: Neural Networks: A Comprehensive Foundation. Prentice Hall, 1999

Kroll, A. Computational Intelligence: Eine Einführung in Probleme, Methoden und technische Anwendungen Oldenbourg Verlag, 2013

Blume, C, Jakob, W: GLEAM - General Learning Evolutionary Algorithm and Method: ein Evolutionärer Algorithmus und seine Anwendungen. KIT Scientific Publishing, 2009 (PDF frei im Internet)

H.-P. Schwefel: Evolution and Optimum Seeking. New York: John Wiley, 1995

Mikut, R.: Data Mining in der Medizin und Medizintechnik. Universitätsverlag Karlsruhe; 2008 (PDF frei im Internet)

T 3.35 Course: Computational Vehicle Dynamics [T-MACH-105350]

Responsible: Prof. Dr.-Ing. Carsten Proppe
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102638 - Schwerpunkt: Bahnsystemtechnik
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-104430 - Schwerpunkt: Modellbildung und Simulation in der Dynamik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2162256	Computational Vehicle Dynamics	2 SWS	Lecture (V)	Proppe
Exams					
SS 2018	76-T-MACH-105350	Computational Vehicle Dynamics		Prüfung (PR)	Proppe
WS 18/19	76-T-MACH-105350	Computational Vehicle Dynamics		Prüfung (PR)	Proppe

Competence Certificate
oral exam, 30 min.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Computational Vehicle Dynamics
2162256, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. Introduction
2. Models of load bearing systems
3. Contact forces between wheels and roadway
4. Simulation of roadways
5. Vehicle models
6. Methods of calculation
7. Performance indicators

Annotation
The course takes place every two years (impair years only).

Workload
Lectures: 20 h

Self-studies: 100 h

Literature
1. K. Popp, W. Schiehlen: Fahrzeugdynamik, B. G. Teubner, Stuttgart, 1993
2. H.-P. Willumeit: Modelle und Modellierungsverfahren in der Fahrzeugdynamik, B. G. Teubner, Stuttgart, 1998
3. H. B. Pacejka: Tyre and Vehicle Dynamics. Butterworth Heinemann, Oxford, 2002
4. K. Knothe, S. Stichel: Schienenfahrzeugdynamik, Springer, Berlin, 2003

T 3.36 Course: Computer Engineering [T-MACH-105360]

Responsible: Dr. Hubert Keller
Dr.-Ing. Maik Lorch

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102817 - Schwerpunkt: Informationstechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	6	Each summer term	1

Events					
SS 2018	2106002	Computer Engineering	2 SWS	Lecture (V)	Keller, Lorch
Exams					
SS 2018	76-T-MACH-105360	Computer Engineering		Prüfung (PR)	Hagenmeyer
WS 18/19	76-T-MACH-105360	Computer Engineering		Prüfung (PR)	Hagenmeyer

Competence Certificate
written exam (Duration: 2 hours)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Computer Engineering

2106002, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Introduction: definitions, basic concepts, introductory examples

Information coding on finite automata: numbers, characters, commands, examples

Algorithm design: definitions, complexity of algorithms, complexity classes P and NP, examples

Sorting algorithms: relevance, algorithms, simplifications, examples

Software quality assurance: terms and measures, errors, phases of quality assurance, constructive measures, analytical measures, certification

Lectures are complemented by an exercice course.

Workload
regular attendance: 31,5 hours
self-study: 73,5 hours

Literature
Lecture Notes (Ilias)

Becker, B., Molitor, P.: Technische Informatik : eine einführende Darstellung. München, Wien : Oldenbourg, 2008.

Hoffmann, D. W.: Grundlagen der Technischen Informatik. München: Hanser, 2007.

Balzert, H.: Lehrbuch Grundlagen der Informatik : Konzepte und Notationen in UML, Java und C++, Algorithmik und Software-Technik, Anwendungen. Heidelberg, Berlin : Spektrum, Akad. Verl., 1999.

Trauboth, H.: Software-Qualitätssicherung : konstruktive und analytische Maßnahmen. München, Wien : Oldenbourg, 1993.

Ada Reference Manual, ISO/IEC 8652:2012(E), Language and Standard Libraries. Springer Heidelberg

Benra, J.; Keller, H.B.; Schiedermeier, G.; Tempelmeier, T.: Synchronisation und Konsistenz in Echtzeitsystemen. Benra, J.T. [Hrsg.] Software-Entwicklung für Echtzeitsysteme Berlin [u.a.] : Springer, 2009, S.49-65

Färber, G.:Prozeßrechentechnik. Springer-Lehrbuch. Springer; Auflage: 3., überarb. Aufl. (7. September 1994)

Leitfaden Informationssicherheit, IT-Grundschutz kompakt. Bundesamt für Sicherheit in der Informationstechnik – BSI53133 Bonn, 2012, BSI-Bro12/311

Cooling, J.: Software Engineering for Real Time Systems. Addison-Wesley, Pearson, Harlow, 2002.

Stallings, W.: Betriebssysteme. 4. Auflage. Pearson Studium, München, 2003.

Summerville, I.: Software Engineering. Pearson Studium, München, 2007.

T 3.37 Course: Computer Science for Engineers [T-MACH-105206]

Responsible: Prof. Dr.-Ing. Jivka Ovtcharova
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102563 - Informatik

Type	Credits	Recurrence	Version
Studienleistung praktisch	0	Each summer term	2

Events					
SS 2018	2121392	Computer Lab for Computer Science in Mechanical Engineering	2 SWS	Practice (PÜ)	Ovtcharova, Mitarbeiter
SS 2018	3121036	Computer Science for Engineers Lab Course	2 SWS	Practice (PÜ)	Ovtcharova, Mitarbeiter
WS 18/19	2121392	Computer Lab for Computer Science in Mechanical Engineering	2 SWS	Practice (PÜ)	Ovtcharova, Mitarbeiter
WS 18/19	3121036	Computer Science for Engineers Lab Course	2 SWS	Practice (PÜ)	Ovtcharova, Mitarbeiter
Exams					
SS 2018	76-T-MACH-105206	Computer Science for Engineers		Prüfung (PR)	Ovtcharova
WS 18/19	76-T-MACH-105206	Computer Science for Engineers		Prüfung (PR)	Ovtcharova

Competence Certificate
Programming assignments, that are to be implemented at the computer, are given every two weeks. The students are supervised by tutors while they work on the assignments. Therefore online tests must be solved by the students to assess the understanding of the tasks and the lecture material. All assignments have to be handed in, before they can take part in the exam.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Computer Lab for Computer Science in Mechanical Engineering

Practice (PÜ)
2121392, SS 2018, 2 SWS, Open in study portal

Learning Content
Introduction to programming using JAVA

Workload
Regular attendance: 21 hours, self-study: 28 hours

V Computer Lab for Computer Science in Mechanical Engineering

Practice (PÜ)
2121392, WS 18/19, 2 SWS, Open in study portal

Learning Content
Introduction to programming using JAVA

Workload
Regular attendance: 21 hours, self-study: 28 hours

T 3.38 Course: Computer Science for Engineers [T-MACH-105205]

Responsible: Prof. Dr.-Ing. Jivka Ovtcharova
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102563 - Informatik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	6	Each summer term	1

Events					
SS 2018	2121390	Computer Science for Engineers	4 SWS	Lecture / Practice (VÜ)	Ovtcharova
SS 2018	2121391	Exercises Computer Science for Engineers	2 SWS	Practice (Ü)	Ovtcharova, Mitarbeiter
SS 2018	3121034	Computer Science for Engineers	2 SWS	Lecture (V)	Ovtcharova, Mitarbeiter
SS 2018	3121035	Computer Science for Engineers (Tutorial)	2 SWS	Practice (Ü)	Ovtcharova, Mitarbeiter
WS 18/19	3121035	Computer Science for Engineers (Tutorial)	2 SWS	Practice (Ü)	Ovtcharova, Mitarbeiter
Exams					
SS 2018	76-T-MACH-105205	Computer Science for Engineers		Prüfung (PR)	Ovtcharova
WS 18/19	76-T-MACH-105205	Computer Science for Engineers		Prüfung (PR)	Ovtcharova

Competence Certificate
Written exam [180 min]

Prerequisites
Computer Science for Engineers, passed

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-105206 - Computer Science for Engineers must have been passed.

Below you will find excerpts from events related to this course:

V Computer Science for Engineers

2121390, SS 2018, 4 SWS, Open in study portal

Lecture / Practice (VÜ)

Learning Content
Basics: Information representation- and processing, terms and definitions: alphabet, data, signals, information, numeral systems, propositional logic and Boolean algebra, computer architectures, programming paradigms.

Object Orientation: Definition and important characteristics of object orientation, Object-oriented modeling with UML.

Data Structures: Definition, properties and application of graphs, trees, linked lists, queues and stacks.

Algorithms: Characteristics of algorithms, complexity analysis, design methods, important examples.

Database management systems: Relational data model, relational algebra, declarative language SQL.

Workload
regular attendance: 21 hours
self-study: 134 hours

V

Exercises Computer Science for Engineers

2121391, SS 2018, 2 SWS, Open in study portal

Practice (Ü)

Learning Content
Basics and language elements of Java
Classes, attributes, methods
Constructors and objects
Loops and conditions
Inheritance, polymorphism
Interfaces, abstract classes
Collections, exceptions
Parallelism, threads

Workload
Regular attendance: 21 hours, self-study: 14 hours

Literature
See lecture

T 3.39 Course: Computerized Multibody Dynamics [T-MACH-105384]

Responsible: Prof. Dr.-Ing. Wolfgang Seemann
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102582 - Schwerpunkt: Kontinuumsmechanik
M-MACH-104430 - Schwerpunkt: Modellbildung und Simulation in der Dynamik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Exams				
SS 2018	76-T-MACH-105384	Computerized Multibody Dynamics	Prüfung (PR)	Seemann
WS 18/19	76-T-MACH-105384	Computerized Multibody Dynamics	Prüfung (PR)	Seemann

Competence Certificate
Oral exam, 30 min.

Prerequisites
none

Recommendation
Knowledge of EM III/IV

T 3.40 Course: Constitution and Properties of Wearresistant Materials [T-MACH-102141]

Responsible: Prof. Dr. Sven Ulrich
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	2

Events					
SS 2018	2194643	Constitution and Properties of Wear resistant materials	2 SWS	Lecture (V)	Ulrich
Exams					
SS 2018	76-T-MACH-102141	Constitution and Properties of Wearresistant Materials		Prüfung (PR)	Ulrich
WS 18/19	76-T-MACH-102141	Constitution and Properties of Wearresistant Materials		Prüfung (PR)	Ulrich

Competence Certificate
oral examination (about 30 min)

no tools or reference materials

Prerequisites
none

Below you will find excerpts from events related to this course:

V Constitution and Properties of Wear resistant materials

2194643, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
introduction

materials and wear

unalloyed and alloyed tool steels

high speed steels

stellites and hard alloys

hard materials

hard metals

ceramic tool materials

superhard materials

new developments

Workload
regular attendance: 22 hours
self-study: 98 hours

Literature

Laska, R. Felsch, C.: Werkstoffkunde für Ingenieure, Vieweg Verlag, Braunschweig, 1981

Schedler, W.: Hartmetall für den Praktiker, VDI-Verlage, Düsseldorf, 1988

Schneider, J.: Schneidkeramik, Verlag moderne Industrie, Landsberg am Lech, 1995

Copies with figures and tables will be distributed

T 3.41 Course: Control Technology [T-MACH-105185]

Responsible: Christoph Gönnheimer
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102817 - Schwerpunkt: Informationstechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	2

Events					
SS 2018	2150683	Control Technology	2 SWS	Lecture (V)	Gönnheimer
Exams					
SS 2018	76-T-MACH-105185	Control Technology		Prüfung (PR)	Fleischer
WS 18/19	76-T-MACH-105185	Control Technology		Prüfung (PR)	Fleischer

Competence Certificate
Written Exam (60 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Control Technology

2150683, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Lecture notes will be provided in ilias (https://ilias.studium.kit.edu/).

Learning Content
The lecture control technology gives an integral overview of
available control components within the field of industrial production systems. The first part of the lecture deals with the fundamentals of signal processing and with control peripherals in the form of sensors and actors which are used in production systems for the detection and manipulation of process states. The second part handles with the function of electric control systems in the production environment. The main focus in this chapter is laid on programmable logic controls, computerized numerical controls and robot controls. Finally the course ends with the topic of cross-linking and decentralization with the help of bus systems.
The lecture is very practice-oriented and illustrated with numerous examples from different branches.

The following topics will be covered:

- Signal processing
- Control peripherals
- Programmable logic controls
- Numerical controls
- Controls for industrial robots
- Process control systems
- Field bus
- Trends in the area of control technology

Annotation
None

Workload
regular attendance: 21 hours
self-study: 99 hours

T 3.42 Course: Data Analytics for Engineers [T-MACH-105694]

Responsible: Nicole Ludwig
Prof. Dr. Ralf Mikut
PD Dr.-Ing. Markus Reischl

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102817 - Schwerpunkt: Informationstechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	5	Each summer term	2

Events					
SS 2018	2106014	Datenanalyse für Ingenieure	3 SWS	Lecture / Practice (VÜ)	Mikut, Reischl, Ludwig
Exams					
SS 2018	76-T-MACH-105694	Datenanalyse für Ingenieure		Prüfung (PR)	Hagenmeyer
WS 18/19	76-T-MACH-105694	Datenanalyse für Ingenieure		Prüfung (PR)	Hagenmeyer

Competence Certificate
Written exam (Duration: 1h)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Datenanalyse für Ingenieure

2106014, SS 2018, 3 SWS, Open in study portal

Lecture / Practice (VÜ)

Learning Content

- Introduction and motivation
- Terms and definitions (types of multidimensional features - time series and images, problem classes)
- Scenario: Problem formulation, feature extraction, evaluation, selection and transformation, distance measures, Bayes classifiers, Support-Vector-Machines, decision trees, clustering, regression, validation
- Biweekly computer exercises (Software practice with Gait-CAD): Data import, benchmark datasets, control of hand prostheses, energy prediction
- 2 hours per week lectures, 1 hour per week computer training

Workload
regular attendance: 32 hours
self-study: 118 hours

Literature
Lecture notes (ILIAS)

Mikut, R.: Data Mining in der Medizin und Medizintechnik. Universitätsverlag Karlsruhe.

2008 (free PDF in the Internet)

Backhaus, K.; Erichson, B.; Plinke, W.; Weiber, R.: Multivariate Analysemethoden: Eine anwendungsorientierte Einführung. Berlin u.a.: Springer. 2000

Burges, C.: A Tutorial on Support Vector Machines for Pattern Recognition. Knowledge Discovery and Data Mining 2(2) (1998), S. 121–167

Tatsuoka, M. M.: Multivariate Analysis. Macmillan. 1988

Mikut, R.; Loose, T.; Burmeister, O.; Braun, S.; Reischl, M.: Dokumentation der MATLAB-Toolbox Gait-CAD. Techn. Ber., Forschungszentrum Karlsruhe GmbH. 2006 (Internet)

T 3.43 Course: Design and Development of Mobile Machines [T-MACH-105311]

Responsible: Prof. Dr.-Ing. Marcus Geimer
Jan Siebert

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2113079	Design and Development of Mobile Machines	2 SWS	Lecture (V)	Geimer, Siebert, Geiger
Exams					
SS 2018	76-T-MACH-105311	Design and Development of Mobile Machines		Prüfung (PR)	Geimer
WS 18/19	76-T-MACH-105311	Design and Development of Mobile Machines		Prüfung (PR)	Geimer

Competence Certificate
The assessment consists of an oral exam (20 min) taking place in the recess period. The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

A registration is mandatory, the details will be announced on the webpages of the *Institute of Vehicle System Technology / Institute of Mobile Machines.* In case of too many applications, attendance will be granted based on pre-qualification.

The course will be replenished by interestung lectures of professionals from leading hydraulic companies.

Prerequisites
Required for the participation in the examination is the preparation of a report during the semester. The partial service with the code T-MACH-108887 must have been passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-108887 - Design and Development of Mobile Machines - Advance must have been passed.

Recommendation
Knowledge in Fluid Power Systems (LV 2114093)

Annotation
After completion of the lecture, studens can:

- design working and travel drive train hydraulics of mobile machines and can derive characteristic key factors.
- choose and apply suitable state of the art designing methods succesfully
- analyse a mobile machines and break its structure down from a complex system to subsystems with reduced complexity
- identify and desrcibe interactions and links between subsystems of a mobile maschine
- present and document solutions of a technical problem according to R&D standards

The number of participants is limited.

Conent:

The working scenario of a mobile machine depends strongly on the machine itself. Highly specialised machines, e.g. pavers are also as common as universal machines with a wide range of applications, e.g. hydraulic excavators. In general, all mobile machines are required to do their intended work in an optimal way and satisfy various critera at the same time. This makes designing mobile machines to a great and interesting challenge. Nevertheless, usually key factors can be derived for every mobile machine, which affect all other machine parameters. During this lecture, those key factors and designing mobile machines accordingly will be adressed. To do so, an exemplary mobile machine will be discussed and designed in the lecture an as a semester project.

Literature:

See german recommendations

Below you will find excerpts from events related to this course:

V **Design and Development of Mobile Machines** **Lecture (V)**
2113079, WS 18/19, 2 SWS, Open in study portal

Learning Content
Wheel loaders and excavators are highly specialized mobile machines. Their function is to detach, pick up and deposit materials near by. Significant size for dimensioning of the machines is the content of their standard shovel. In this lecture the main steps in dimensioning a wheel loader or excavator are beeing thought. This includes among others:

- Defining the size and dimensions,
- the dimensioning of the drive train,
- Determining the kinematics of the equipment,
- the dimension of the working hydraulics and
- Calculations of strength

The entire design process of these machines is strongly influenced by the use of standards and guidelines (ISO/DIN-EN). Even this aspect is dealt with.

The lecture is based on the knowledge from the fields of mechanics, strength of materials, machine elements, propulsion and fluid technique. The lecture requires active participation and continued collaboration.

Workload

- regular attendance: 21 hours
- self-study: 99 hours

Literature
None.

T 3.44 Course: Design and Development of Mobile Machines - Advance [T-MACH-108887]

Responsible: Prof. Dr.-Ing. Marcus Geimer
Jan Siebert

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion

Type	Credits	Recurrence	Version
Studienleistung	0	Each term	1

Exams				
WS 18/19	76-T-MACH-108887	Design and Development of Mobile Machines - Advance	Prüfung (PR)	Geimer

Competence Certificate
Preparation of semester report

Prerequisites
none

T 3.45 Course: Design of a jet engine combustion chamber [T-CIWVT-105780]

Responsible: Prof. Dr.-Ing. Nikolaos Zarzalis
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	6	Each winter term	2

Events					
WS 18/19	22527	Design of a jet engine combustion chamber	SWS	Project/Seminar (PJ/S)	Zarzalis

Competence Certificate
The examination is an oral examination on lecture 22527 with a duration of 20 minutes.

Prerequisites
None

T 3.46 Course: Design Project Machine Tools and Industrial Handling [T-MACH-105227]

Responsible: Prof. Dr.-Ing. Jürgen Fleischer
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102589 - Schwerpunkt: Produktionssysteme

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	2

Events					
WS 18/19	2149903	Design Project Machine Tools and Industrial Handling	2 SWS	Project group (Pg)	Fleischer
Exams					
SS 2018	76-T-MACH-105227	Design Project Machine Tools and Industrial Handling		Prüfung (PR)	Fleischer
WS 18/19	76-T-MACH-105227	Design Project Machine Tools and Industrial Handling		Prüfung (PR)	Fleischer

Competence Certificate
Oral Exam (20 min)

Prerequisites
The Design Project Machine Tools an Industrial Handling can only be combined with the lecture Machine Tools and Industrial Handling (T-MACH-102158 oder T-MACH-109055).

The number of students is limited to five.

Modeled Conditions
You have to fulfill one of 2 conditions:

1. The course T-MACH-102158 - Machine Tools and Industrial Handling must have been started.
2. The course T-MACH-109055 - Machine Tools and Industrial Handling must have been started.

Below you will find excerpts from events related to this course:

V Design Project Machine Tools and Industrial Handling

2149903, WS 18/19, 2 SWS, Open in study portal

Project group (Pg)

Description
Media:

SharePoint, Siemens NX 11.0

Notes
The dates and deadlines for the event will be published on the homepage http://www.wbk.kit.edu/studium-und-lehre.php. The number of participants is limited to five students.

Learning Content
The Design Project Machine Tools and Industrial Handling offers a practical insight into the development of machine tools. A student team works on a current and concrete problem in the field of machine tools. This problem is introduced into the project by an industrial partner.
First, the problem is to be translated into work packages. Following the project plan, ideas and concepts are to be developed as to how the problem is to be solved. Based on the concepts, the validation is carried out using analytical and numerical methods. The results of the project will be presented in a final meeting. The project is carried out by the students under the guidance of scientific staff and in cooperation with the industrial partner. The development project offers students

- the unique opportunity to put the contents of the accompanying lecture into practice in an interdisciplinary and creative context,
- to gain insights into a wide range of development activities relevant for their future careers,
- cooperation with an attractive industrial partner,
- work in a team with other students with competent support from scientific staff,
- first practical experience in project management.

Workload
regular attendance: 21 hours
self-study: 99 hours

T 3.47 Course: Design with Plastics [T-MACH-105330]

Responsible: Markus Liedel
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2174571	Design with Plastics	2 SWS	Lecture (V)	Liedel
Exams					
SS 2018	76-T-MACH-105330	Design with Plastics		Prüfung (PR)	Liedel
WS 18/19	76-T-MACH-105330	Design with Plastics		Prüfung (PR)	Liedel

Competence Certificate
Oral exam, about 20 minutes

Prerequisites
none

Recommendation
Poly I

Below you will find excerpts from events related to this course:

V Design with Plastics
2174571, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Structure and properties of plastics materials,

Processing of plastics,

Behavior of plastics under environmental impacts,

Classic strength dimensioning,

Geometric dimensioning,

Plastic appropriate design,

Failure examples,

Joining of plastic parts,

Supporting simulation tools,

Structural foams,

Plastics Technology trends.

Workload
The workload for the lecture Design with Plastics is 120 h per semester and consists of the presence during the lecture (21 h) as well as preparation and rework time at home (99 h).

Literature
Scriptum will be handed out during the lecture.
Recommended literature are provided in the lecture.

T 3.48 Course: Development of Oil-Hydraulic Powertrain Systems [T-MACH-105441]

Responsible: Isabelle Ays
Dr.-Ing. Gerhard Geerling

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2113072	Development of Oil-Hydraulic Powertrain Systems	2 SWS	Block lecture (BV)	Geerling, Ays, Becker
Exams					
SS 2018	76-T-MACH-105441	Development of Oil-Hydraulic Powertrain Systems		Prüfung (PR)	Geimer
WS 18/19	76-T-MACH-105441	Development of Oil-Hydraulic Powertrain Systems		Prüfung (PR)	Geimer

Competence Certificate
oral exam (20 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Development of Oil-Hydraulic Powertrain Systems

2113072, WS 18/19, 2 SWS, Open in study portal

Block lecture (BV)

Learning Content
The bloc course offered by the Chair of Mobile Machines (Mobima) conveys the basics of planning and development of mobile and industrial hydrostatic systems. The lecturer works for a market leading company producing fluid power drives and controls and gives a deep view into the process of planning and development using real life examples. The contents of the course are:

- marketing, project planning
- hydrostatic circuits
- heat balance, hydraulic accumulators
- filtration, noise lowering
- development exercises + laboratory tutorial

Workload

- regular attendance: 19 hours
- self-study: 90 hours

T 3.49 Course: Digital Control [T-MACH-105317]

Responsible: Dr.-Ing. Michael Knoop
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102817 - Schwerpunkt: Informationstechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	1

Events					
WS 18/19	2137309	Digital Control	2 SWS	Lecture (V)	Knoop
Exams					
SS 2018	76-T-MACH-105317	Digital Control		Prüfung (PR)	Stiller
WS 18/19	76-T-MACH-105317	Digital Control		Prüfung (PR)	Stiller

Competence Certificate
written exam

60 min.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Digital Control

2137309, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. Introduction into digital control:
Motivation for digital implementation of controllers Structure of digital feedback control loops Sample and hold units
2. State space analysis and design:
Discretisation of continuous-time systems Discrete-time state space equations Stability - definition and criteria State feedback design by eigenvalue assignment PI state feedback controller Luenberger observer, separation theorem
Systems with dead-time Deadbeat design
3. Analysis and design based on z-transform: z-transform - definition and theorems Control loop description in the z domain Stability criteria Root locus controller design Transfer of continuous-time controllers into discrete-time controllers

Workload
120 hours

Literature

- Lunze, J.: Regelungstechnik 2, 3. Auflage, Springer Verlag, Berlin Heidelberg 2005
- Unbehauen, H.: Regelungstechnik, Band 2: Zustandsregelungen, digitale und nichtlineare Regelsysteme. 8. Auflage, Vieweg Verlag, Braunschweig 2000
- Föllinger, O.: Lineare Abtastsysteme. 4. Auflage, R. Oldenbourg Verlag, München Wien 1990
- Ogata, K.: Discrete-Time Control Systems. 2nd edition, Prentice-Hall, Englewood Cliffs 1994
- Ackermann, J.: Abtastregelung, Band I, Analyse und Synthese. 3. Auflage, Springer Verlag, Berlin Heidelberg 1988

3.50 Course: Dimensioning and Optimization of Power Train System [T-MACH-105536]

Responsible: Dr.-Ing. Hartmut Faust
Dr. Eckhard Kirchner

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2146208	Dimensioning and Optimization of Power Train System	2 SWS	Lecture (V)	Faust
Exams					
SS 2018	76-T-MACH-105536	Dimensioning and Optimization of Power Train System		Prüfung (PR)	Albers
WS 18/19	76-T-MACH-105536	Dimensioning and Optimization of Power Train System		Prüfung (PR)	Albers

Competence Certificate
oral exam (20 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

Dimensioning and Optimization of Power Train System

2146208, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content

1. Architectures: conventional, hybrid and electrical transmissions
2. The gear as system in a vehicle
3. Components and power flow ofsynchromesh gears
4. Spur gears
5. Synchronization
6. Switching systems for vehicles with manual transmission
7. Actuators
8. Comfort aspects for manual transmissions
9. Torque converter
10. Planetary sets
11. Power conversion in automatic transmissions
12. Continuously variable transmission systems
13. Differentials and components for power split
14. Drive train for commercial vehicles
15. Gears and electrical machines for electro mobility

Workload
regular attendance: 21 h

self-study: 99 h

T 3.51 Course: Drive Systems and Possibilities to Increase Efficiency [T-MACH-105451]

Responsible: Dr.-Ing. Hans-Peter Kollmeier
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102645 - Schwerpunkt: Technik des Verbrennungsmotors

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	2	Each winter term	1

Events					
WS 18/19	2133112	Drive Systems and Possibilities to Increase Efficiency	1 SWS	Lecture (V)	Kollmeier
Exams					
SS 2018	76-T-MACH-105451	Drive Systems and Possibilities to Increase Efficiency		Prüfung (PR)	Koch
WS 18/19	76-T-MACH-105451	Drive Systems and Possibilities to Increase Efficiency		Prüfung (PR)	Koch

Competence Certificate
Oral examination, time duration 30 min., no aids

Prerequisites
none

Below you will find excerpts from events related to this course:

V Drive Systems and Possibilities to Increase Efficiency
2133112, WS 18/19, 1 SWS, Open in study portal

Lecture (V)

Description
Media:

Lecture with powerpoint slides

Learning Content
The students attend to propulsion systems and possibilities for increasing efficiency and get an overview about the demand of energy of stationary and mobile propulsion systems. Furthermore they get an overview about possibilities for increasing efficiency by the use of storage systems, systems of waste heat recovery and lightweight construction systems. There is also a view on complete systems for increasing efficiency as combined heat and power plant and hybrid propulsion systems.

Annotation
none

Workload
Time of attendence: 11 h
self-study: 49 h (grob abschätzen, Richtwert: 2 bis 4 mal Präsenzzeit)

Literature
Download of powerpoint slides

T 3.52 Course: Drive Train of Mobile Machines [T-MACH-105307]

Responsible: Prof. Dr.-Ing. Marcus Geimer
Marco Wydra

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2113077	Drive Train of Mobile Machines	2 SWS	Lecture (V)	Geimer, Herr
WS 18/19	2113078	Übung zu 'Antriebsstrang mobiler Arbeitsmaschinen'	1 SWS	Practice (Ü)	Geimer, Herr
Exams					
SS 2018	76-T-MACH-105307	Drive Train of Mobile Machines		Prüfung (PR)	Geimer
WS 18/19	76-T-MACH-105307	Drive Train of Mobile Machines		Prüfung (PR)	Geimer

Competence Certificate
The final assessment will be an oral examination (20 min) taking place during the recess period. The examination will be offered in ervery semester and can be repeated at any regular examination date.

Prerequisites
none

Recommendation

- General principles of mechanicals engineering
- Basic knowledge of hydraulics
- Interest in mobile machinery

Annotation
At the end of the lecture, participants can explain the structure and function of all discussed drive trains of mobile machines. They can analyze complex gearbox schematics and synthesize simple transmission functions using rough calculations.

Content:

In this course the different drive trains of mobile machinery will be discussed. The focus of this course is:

- mechanical gears
- torque converter
- hydrostatic drives
- power split drives
- electrical drives
- hybrid drives
- axles
- terra mechanics

Media: projector presentation

Literature: Download of lecture slides from ILIAS. Further literature recommendations during lectures.

Below you will find excerpts from events related to this course:

V Drive Train of Mobile Machines

2113077, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

projector presentation

Learning Content
In this course will be discussed the different drive train of mobile machinerys. The fokus of this course is:
- improve knowledge of fundamentals
- mechanical gears
- torque converter
- hydrostatic drives
- continuous variable transmission
- eletrical drives
- hybrid drives
- axles
- terra mechanic

Workload

- regular attendance: 21 hours
- self-study: 89 hours

Literature
download of scriptum via ILIAS

T 3.53 Course: Dynamics of the Automotive Drive Train [T-MACH-105226]

Responsible: Prof. Dr.-Ing. Alexander Fidlin
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-104430 - Schwerpunkt: Modellbildung und Simulation in der Dynamik
M-MACH-104442 - Schwerpunkt: Schwingungslehre

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	5	Each winter term	1

Events					
WS 18/19	2163111	Dynamics of the Automotive Drive Train	2 SWS	Lecture (V)	Fidlin
WS 18/19	2163112	Übungen zu Dynamik des Kfz-Antriebsstrangs	2 SWS	Practice (Ü)	Fidlin, Aramendiz Fuentes
Exams					
SS 2018	76-T-MACH-105226	Dynamics of the Automotive Drive Train		Prüfung (PR)	Fidlin
WS 18/19	76-T-MACH-105226	Dynamics of the Automotive Drive Train		Prüfung (PR)	Fidlin

Competence Certificate
Oral examination, 30 min.

Prerequisites
none

Recommendation
Powertrain Systems Technology A: Automotive SystemsMachine DynamicsVibration Theory

Below you will find excerpts from events related to this course:

V Dynamics of the Automotive Drive Train
2163111, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content

- Main components of the vehicle powertrain and their modelling
- Typical driving situations
- Problemoriented models for particular driving situations
- System analysis and optimization with respect to dynamic behavior

Workload
time of attendance: 39 h
self-study: 201 h

Literature

- Dresig H. Schwingungen mechanischer Antriebssysteme, 2. Auflage, Springer, 2006
- Pfeiffer F., Mechanical System Dynamics, Springer, 2008
- Laschet A., Simulation von Antriebssystemen:Modellbildung der Schwingungssysteme und Beispiele aus der Antriebstechnik, Springer, 1988

T 3.54 Course: Electric Rail Vehicles [T-MACH-102121]

Responsible: Prof. Dr.-Ing. Peter Gratzfeld
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102638 - Schwerpunkt: Bahnsystemtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2114346	Electric Rail Vehicles	2 SWS	Lecture (V)	Gratzfeld
Exams					
SS 2018	76-T-MACH-102121	Electrical Railway Traction Systems		Prüfung (PR)	Gratzfeld
WS 18/19	76-T-MACH-102121	Electric Rail Vehicles		Prüfung (PR)	Gratzfeld
WS 18/19	76-T-MACH-102122	Electric Rail Vehicles		Prüfung (PR)	Gratzfeld

Competence Certificate
Oral examination

Duration: 20 minutes

No tools or reference materials may be used during the exam.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Electric Rail Vehicles

2114346, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

All slides are available for download (Ilias-platform).

Learning Content
History of electric traction with railway vehicles, economic impact

Vehicle dynamics: running resistance, tractive effort diagram, running cycles

Wheel-rail-contact

Electric drives: traction motors, power conversion, drives for vehicles at dc and ac lines, dieselelectric vehicles, multi system vehicles, axle drives, transmission of tractive effort to the rails

Traction power supply: networks, substations, inductive power supply, energy management

Modern vehicle concepts for mass transit and main line

Workload
Regular attendance: 21 hours

Self-study: 21 hours

Exam and preparation: 78 hours

Literature
A bibliography is available for download (Ilias-platform).

T 3.55 Course: Electrical Engineering and Electronics [T-ETIT-109820]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104801 - Elektrotechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	8	Each winter term	1

Events					
WS 18/19	2306339	Electrical Engineering and Electronics foir Mechanical Engineers	4+2 SWS	Lecture / Practice (VÜ)	Becker
Exams					
WS 18/19	7306351	Electrical Engineering and Electronics for Mechanical Engineers		Prüfung (PR)	Becker

Annotation
Exam will be held in german language

T 3.56 Course: Electrical Engineering and Electronics [T-ETIT-108386]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104049 - Elektrotechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	8	Each winter term	1

Events					
WS 18/19	2306350	Electrical Engineering and Electronics for Mechanical Engineers	4+2 SWS	Lecture / Practice (VÜ)	Stahl, Poletkin
Exams					
WS 18/19	7306350	Electrical Engineering and Electronics for Mechanical Engineers		Prüfung (PR)	Becker

Competence Certificate
Written exam, duration 3 hours.

Prerequisites
none

Annotation
Exam will be held in english language.

T 3.57 Course: Elements and Systems of Technical Logistics [T-MACH-102159]

Responsible: Georg Fischer
Dr.-Ing. Martin Mittwollen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2117096	Elements and systems of Technical Logistics	3 SWS	Lecture / Practice (VÜ)	Mittwollen, Fischer
Exams					
SS 2018	76-T-MACH-102159	Elements and Systems of Technical Logistics		Prüfung (PR)	Mittwollen
WS 18/19	76-T-MACH-102159	Elements and Systems of Technical Logistics		Prüfung (PR)	Mittwollen

Competence Certificate
The assessment consists of an oral exam (20min) taking place in the recess period according to § 4 paragraph 2 Nr. 2 of the examination regulation.

Prerequisites
none

Recommendation
Knowledge out of Basics of Technical Logistics (T-MACH-102163) preconditioned

Below you will find excerpts from events related to this course:

V Elements and systems of Technical Logistics

2117096, WS 18/19, 3 SWS, Open in study portal

Lecture / Practice (VÜ)

Learning Content

- material flow systems and their (conveying) technical components
- mechanical behaviour of conveyors;
- structure and function of conveyor machines; elements of intralogistics (belt conveyor, racks, automatic guided vehicles, fan-in, bifurcation, and etc.)
- sample applications and calculations in addition to the lectures inside practical lectures

Annotation
Knowledge out of **Basics of Technical Logistics** preconditioned

Workload
presence: 36h

rework: 84h

Literature
recommendations during lectures

T 3.58 Course: Elements and Systems of Technical Logistics - Project [T-MACH-108946]

Responsible: Georg Fischer
Dr.-Ing. Martin Mittwollen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung anderer Art	2	Each winter term	1

Events					
WS 18/19	2117097	Elements and systems of Technical Logistics - project	SWS	Project (PRO)	Mittwollen, Fischer
Exams					
WS 18/19	76-T-MACH-108946	Elements and Systems of Technical Logistics - Project		Prüfung (PR)	Mittwollen

Competence Certificate
Presentation of performed project and defense (30min) according to $4 (2), No. 3 of the examination regulation

Prerequisites
T-MACH-102159 (Elements and Systems of Technical Logistics) must have been started

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-102159 - Elements and Systems of Technical Logistics must have been started.

Recommendation
Knowledge out of Basics of Technical Logistics (T-MACH-102163) preconditioned

Below you will find excerpts from events related to this course:

V Elements and systems of Technical Logistics - project
2117097, WS 18/19, SWS, Open in study portal

Project (PRO)

Description
Media:

supplementary sheets,presentations, blackboard

Learning Content

- mechanical behaviour of conveyors;
- structure and function of conveyor machines;
- elements of intralogistics (belt conveyor, racks, automatic guided vehicles, fan-in, bifurcation, and etc.)
- sample applications and calculations in addition to the lectures inside practical lectures
- Self manufacturing of a project report to recesses the topic.

Annotation
Knowledge out of **Basics of Technical Logistics (LV 2117095)** preconditioned

T 3.59 Course: Energy Efficient Intralogistic Systems [T-MACH-105151]

Responsible: Dr.-Ing. Meike Braun
Dr.-Ing. Frank Schönung

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik
M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2117500	Energy efficient intralogistic systems	2 SWS	Lecture (V)	Braun, Schönung
Exams					
SS 2018	76-T-MACH-105151	Energy Efficient Intralogistic Systems		Prüfung (PR)	Braun
WS 18/19	76-T-MACH-105151	Energy Efficient Intralogistic Systems		Prüfung (PR)	Braun

Competence Certificate
Oral, 30 min. examination dates after the end of each lesson period.

Prerequisites
none

Recommendation
The content of course “Basics of Technical Logistics” should be known.

Annotation
Visit the IFL homepage of the course for the course dates and/or possible limitations of course participation.

Below you will find excerpts from events related to this course:

V Energy efficient intralogistic systems

2117500, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Description
Media:
presentations, black board

Notes
The content of course “Basics of Technical Logistics” should be knownn.

Learning Content
The main focuses of the course are:

- green supply chain
- processes in Intralogistic systems
- evaluation of energy consumption of conveyors
- modeling of conveying systems
- methods for energy savings
- approaches for energy efficiency increasing of continuous and discontinuous conveyors
- dimensioning energy efficient drives
- new approaches for resource efficient conveying systems.

Annotation
Visit the IFL homepage of the course for the course dates and/or possible limitations of course participation

Workload
regular attendance: 21 hours
self-study: 99 hours

Literature
None.

T 3.60 Course: Energy Storage and Network Integration [T-MACH-105952]

Responsible: Dr.-Ing. Wadim Jäger
Prof. Dr. Robert Stieglitz

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2189487	Energiespeicher und Netzintegration	2 SWS	Lecture (V)	Jäger, Stieglitz
Exams					
SS 2018	76-T-MACH-105952	Energiespeicher und Netzintegration		Prüfung (PR)	Stieglitz
WS 18/19	76-T-MACH-105952	Energiespeicher und Netzintegration		Prüfung (PR)	Stieglitz

Competence Certificate
oral exam, about 30 minutes

Prerequisites
The courses T-MACH-105952 Energiespeicher und Netzintegration and T-ETIT-104644 - Energy Storage and Network Integration can not be combined.

Below you will find excerpts from events related to this course:

V Energiespeicher und Netzintegration

2189487, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
The lecture provides an overview of the different storage types and their fundamental integration into the power supply grid.

Thereby, within the scope of this lecture, the necessity and the motivation for converting and storing energy will be given. Starting from the definition of fundamental terms different physical and chemical storage types along with their theoretical and practical basis are described. In particular, the decoupling of energy production and energy consumption, and the provision of different energy scales (time, power, density) will be discussed. Furthermore, the challenge of energy transport and re-integration into the different grid types is considered.

T 3.61 Course: Energy Systems I: Renewable Energy [T-MACH-105408]

Responsible: Dr. Ron Dagan
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	6	Each winter term	1

Events					
WS 18/19	2129901	Energy Systems I - Renewable Energy	3 SWS	Lecture (V)	Dagan
Exams					
SS 2018	76-T-MACH-105408	Energy Systems I: Renewable Energy		Prüfung (PR)	Stieglitz, Dagan
WS 18/19	76-T-MACH-105408	Energy Systems I: Renewable Energy		Prüfung (PR)	Dagan

Competence Certificate
oral exam, 1/2 hour

Prerequisites
none

Below you will find excerpts from events related to this course:

V Energy Systems I - Renewable Energy

2129901, WS 18/19, 3 SWS, Open in study portal

Lecture (V)

Learning Content
The course deals with fundamental aspects of renewable energies.

1. The first part deals with the basic concepts of absorbing solar beans, in an efficient manner accounting for the minimization of heat losses. In this context, selective topics on Thermodynamics as well as fluid dynamics are introduced. In the second part few applications are discussed and optimizations techniques of solar collectors construction and their heat transfer are presented.
2. The use of solar energy as a source for heat generation is followed by the idea of electricity generation. Introductive aspects of Photovoltaic technologies are illuminated.
3. The last part presents additional regenerative energy sources such as wind and geothermal energy.

Workload
regular attendance: 34 hours
self-study: 146 hours

T 3.62 Course: Engine Laboratory [T-MACH-105337]

Responsible: Dr.-Ing. Uwe Wagner
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102645 - Schwerpunkt: Technik des Verbrennungsmotors

Type	Credits	Recurrence	Version
Studienleistung	4	Each summer term	1

Events					
SS 2018	2134001	Engine Laboratory	2 SWS	Practical course (P)	Wagner
Exams					
SS 2018	76-T-MACH-105337	Engine Laboratory		Prüfung (PR)	Koch
WS 18/19	76-T-MACH-105337	Engine Laboratory		Prüfung (PR)	Koch

Competence Certificate
written documentation of every experiment, certificate of successful attendance, no grading

Prerequisites
none

Below you will find excerpts from events related to this course:

V Engine Laboratory

2134001, SS 2018, 2 SWS, Open in study portal

Practical course (P)

Learning Content
5 engine experiments in up-to-date development projects

Workload
regular attendance: 40 hours
self-study: 80 hours

Literature
Description of experiments

T 3.63 Course: Engine Measurement Techniques [T-MACH-105169]

Responsible: Dr.-Ing. Sören Bernhardt
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102645 - Schwerpunkt: Technik des Verbrennungsmotors
M-MACH-102817 - Schwerpunkt: Informationstechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2134137	Engine measurement techniques	2 SWS	Lecture (V)	Bernhardt
Exams					
SS 2018	76-T-MACH-105169	Engine Measurement Techniques		Prüfung (PR)	Koch
WS 18/19	76-T-MACH-105169	Engine Measurement Techniques		Prüfung (PR)	Koch

Competence Certificate
oral examination, Duration: 0,5 hours, no auxiliary means

Prerequisites
none

Recommendation
T-MACH-102194 Combustion Engines I

Below you will find excerpts from events related to this course:

V Engine measurement techniques
2134137, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Students get to know state-of-the-art measurement techniques for combustion engines. In particular basic techniques for measuring engine operating parameters such as torque, speed, power and temperature.

Possible measurement errors and abberations are discussed.

Furthermore techniques for measuring exhaust emissions, air/fuel ratio, fuel consumption as well as pressure indication for thermodynamic analysis are covered.

Workload
regular attendance: 21 hours
self-study: 100 hours

Literature

1. Grohe, H.:Messen an Verbrennungsmotoren
2. Bosch: Handbuch Kraftfahrzeugtechnik
3. Veröffentlichungen von Firmen aus der Meßtechnik
4. Hoffmann, Handbuch der Meßtechnik
5. Klingenberg, Automobil-Meßtechnik, Band C

T 3.64 Course: Engineering Mechanics I [T-MACH-100282]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Dr.-Ing. Tom-Alexander Langhoff

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102572 - Technische Mechanik
M-MACH-104624 - Orientierungsprüfung

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	7	Each winter term	2

Events					
WS 18/19	2161245	Engineering Mechanics I	3 SWS	Lecture (V)	Böhlke
WS 18/19	3161010	Engineering Mechanics I (Lecture)	3 SWS	Lecture (V)	Langhoff, Böhlke
Exams					
SS 2018	76-T-MACH-100282	Engineering Mechanics I		Prüfung (PR)	Böhlke, Langhoff
WS 18/19	76-T-MACH-100282	Engineering Mechanics I		Prüfung (PR)	Böhlke, Langhoff
WS 18/19	76-T-MACH-100282-englisch	Engineering Mechanics I		Prüfung (PR)	Böhlke, Langhoff

Competence Certificate
written exam, 90 min, graded

Prerequisites
successful participation in "Engineering Mechanics I (Tutorial)" (see T-MACH-100528)

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-100528 - Tutorial Engineering Mechanics I must have been passed.

Below you will find excerpts from events related to this course:

V Engineering Mechanics I

2161245, WS 18/19, 3 SWS, Open in study portal

Lecture (V)

Learning Content

- basics of vector calculus
- force systems
- statics of rigid bodies
- internal forces and moments in bars and beams
- friction
- centre of gravity, centre of mass
- work, energy, principle of virtual work
- statics of inextensible ropes
- elastostatics of tension-compression- bars

Workload
regular attendance: 52,5 hours
self-study: 127,5 hours

Literature

lecture notes

Hibbeler, R.C: Technische Mechanik 1 - Statik. Prentice Hall. Pearson Studium 2005.

Gross, D. et al.: Technische Mechanik 1 - Statik. Springer 2006.

Gummert, P.; Reckling, K.-A.: Mechanik. Vieweg 1994.

Parkus, H.: Mechanik der festen Körper. Springer 1988.

T 3.65 Course: Engineering Mechanics II [T-MACH-100283]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Dr.-Ing. Tom-Alexander Langhoff

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102572 - Technische Mechanik
M-MACH-104624 - Orientierungsprüfung

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	6	Each summer term	2

Events					
SS 2018	2162250	Engineering Mechanics II	3 SWS	Lecture (V)	Böhlke
SS 2018	3162010	Engineering Mechanics II (Lecture)	2 SWS	Lecture (V)	Langhoff, Pallicity, Böhlke
Exams					
SS 2018	76-T-MACH-100283	Engineering Mechanics II		Prüfung (PR)	Böhlke, Langhoff
WS 18/19	76-T-MACH-100283	Engineering Mechanics II		Prüfung (PR)	Böhlke, Langhoff
WS 18/19	76-T-MACH-100283-englisch	Engineering Mechanics II		Prüfung (PR)	Böhlke, Langhoff

Competence Certificate
written exam, 90 min, graded

Prerequisites
successful participation in "Engineering Mechanics II (Tutorial)" (see T-MACH-100284)

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-100284 - Tutorial Engineering Mechanics II must have been passed.

Below you will find excerpts from events related to this course:

V Engineering Mechanics II

2162250, SS 2018, 3 SWS, Open in study portal

Lecture (V)

Learning Content

- bending
- shear
- torsion
- stress and strain state in 3D
- Hooke's law in 3D
- elasticity theors in 3D
- energy methods in elastostatics
- approximation methods
- stability
- inelastic material behaviour

Workload
regular attendance: 42 hours
self-study: 138 hours

Literature
lecture notes
Hibbeler, R.C: Technische Mechanik 2 - Festigkeitslehre. Prentice Hall. Pearson Studium 2005.
Gross, D. et al.: Technische Mechanik 2 - Elastostatik. Springer 2006.
Gummert, P.; Reckling, K.-A.: Mechanik. Vieweg 1994.
Parkus, H.: Mechanik der festen Körper. Springer 1988.

T 3.66 Course: Engineering Mechanics III & IV [T-MACH-105201]

Responsible: Prof. Dr.-Ing. Wolfgang Seemann
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102572 - Technische Mechanik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	10	Each winter term	2

Events					
SS 2018	2162231	Engineering Mechanics IV	2 SWS	Lecture (V)	Seemann
SS 2018	3162012	Engineering Mechanics 4	2 SWS	Lecture (V)	Seemann
WS 18/19	2161203	Engineering Mechanics III	2 SWS	Lecture (V)	Seemann
WS 18/19	3161012	Engineering Mechanics III (Lecture)	2 SWS	Lecture (V)	Seemann
Exams					
SS 2018	76-T-MACH-105201	Engineering Mechanics III & IV		Prüfung (PR)	Seemann
WS 18/19	76-T-MACH-105201	Engineering Mechanics III & IV		Prüfung (PR)	Seemann

Competence Certificate
Written Exam (3 h), graded

Prerequisites
Succesful accomplishment of the exercise sheets in Engineering Mechanics III (T-MACH-105202) and of the exercise sheets in Engineering Mechanics IV (T-MACH-105203).

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-105202 - Tutorial Engineering Mechanics III must have been passed.
2. The course T-MACH-105203 - Tutorial Engineering Mechanics IV must have been passed.

Below you will find excerpts from events related to this course:

V Engineering Mechanics IV
2162231, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Spatial kinematics of a rigid body, Euler angles, angular velocity using Euler angles, Euler's equations, inertia tensor, kinetic energy of a rigid body, free gyroscopes, forced gyroscopes, systems of rigid bodies, principle of d'Alembert, Lagrange's equations of the first and second kind, generalized coordinates, free and forced vibration of one degree of freedom systems, frequency response, vibration of multi degree of freedom systems, vibration absorption

Workload
time of attendance: 24h; self-study: 65h

Literature
Hibbeler: Technische Mechanik 3, Dynamik, München, 2006
Marguerre: Technische Mechanik III, Heidelberger Taschenbücher, 1968
Magnus: Kreisel, Theorie und Anwendung, Springer-Verlag, Berlin,
1971 Klotter: Technische Schwingungslehre, 1. Bd. Teil A, Heidelberg

V Engineering Mechanics III
2161203, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Kinematics: Cartesian, cylindrical and natural coordinates. Time derivatives in moving reference frames, angular velocities of reference frames.

Kinetics of a particle:
Newton's axiom, Principle of d'Alembert, work of a force, kinetic and potential energies, principle of linear momentum, principle of moment of momentum, kinetics in moving reference systems

Systems of particles:
Principle of center of mass, Principle of moment of momentum, impacts between particles, systems with variable mass, applications.

Plain motion of rigid bodies:
Pure translation, pure rotation, general plain motion. Instantaneous center of rotation, Kinetics, moment of momentum, principle of work and principle of energy conservation for a rotation around a space-fixed axis. Mass moment of inertia, parallel-axis-theorem.Principle of linear momentum and principle of moment of momentum for arbitrary plain motion. Principle of d'Alembert for plain motion. Principles of linear and moment of momentum in integral form. Applications for impact problems.

Workload
time of attendance: 24h; self-study: 65h

Literature
Hibbeler: Technische Mechanik 3, Dynamik, München, 2006

Gross, Hauger, Schnell: Technische Mechanik Bd. 3, Heidelberg, 1983

Lehmann: Elemente der Mechanik III, Kinetik, Braunschweig, 1975

Göldner, Holzweissig: Leitfaden der Technischen Mechanik.

Hagedorn: Technische Mechanik III.

T 3.67 Course: Excercises in Technical Thermodynamics and Heat Transfer I [T-MACH-105204]

Responsible: Prof. Dr. Ulrich Maas
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102574 - Technische Thermodynamik

Type	Credits	Recurrence	Version
Studienleistung schriftlich	0	Each winter term	1

Events					
WS 18/19	2165502	Exercise course Technical Thermodynamics and Heat Transfer I	2 SWS	Practice (Ü)	Maas
WS 18/19	3165015	Technical Thermodynamics and Heat Transfer I (Tutorial)	2 SWS	Practice (Ü)	Schießl, Maas
Exams					
SS 2018	76-T-MACH-105204	Excercises in Technical Thermodynamics and Heat Transfer I		Prüfung (PR)	Maas
WS 18/19	76-T-MACH-105204	Excercises in Technical Thermodynamics and Heat Transfer I		Prüfung (PR)	Maas

Competence Certificate
Homework is mandatory.

T 3.68 Course: Excercises in Technical Thermodynamics and Heat Transfer II [T-MACH-105288]

Responsible: Prof. Dr. Ulrich Maas
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102574 - Technische Thermodynamik

Type	Credits	Recurrence	Version
Studienleistung	0	Each summer term	1

Events					
SS 2018	2166556	Technical Thermodynamics and Heat Transfer II (Tutorial)	2 SWS	Practice (Ü)	Maas
SS 2018	3166033	Technical Thermodynamics and Heat Transfer II (Tutorial)	2 SWS	Practice (Ü)	Schießl, Maas
Exams					
SS 2018	76-T-MACH-105288	Excercises in Technical Thermodynamics and Heat Transfer II		Prüfung (PR)	Maas
WS 18/19	76-T-MACH-105288	Excercises in Technical Thermodynamics and Heat Transfer II		Prüfung (PR)	Maas

Competence Certificate
Homework is mandatory.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Technical Thermodynamics and Heat Transfer II (Tutorial)

2166556, SS 2018, 2 SWS, Open in study portal

Practice (Ü)

Learning Content
Calculation of thermodynamical problems

Workload
Regular attendance: 21,0 hours
Self-stuy: 28 hours

Literature
Course notes
Elsner, N.; Dittmann, A.: Energielehre und Stoffverhalten (Grundlagen der technischen Thermodynamik Bd. 1 und 2), 8. Aufl., Akademie-Verlag, 680 S. 1993.
Baehr, H.D.: Thermodynamik: eine Einführung in die Grundlagen und ihre technischen Anwendungen, 9. Aufl., Springer-Verlag, 460 S., 1996.

T 3.69 Course: Exercices - Tribology [T-MACH-109303]

Responsible: Prof. Dr. Martin Dienwiebel
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme

Type	Credits	Recurrence	Expansion	Version
Studienleistung	0	Each winter term	1 terms	1

Events					
WS 18/19	2181114	Tribology	5 SWS	Lecture / Practice (VÜ)	Dienwiebel, Scherge
Exams					
WS 18/19	76-T-MACH-109303	Exercices - Tribology		Prüfung (PR)	Dienwiebel

Competence Certificate
successful solving of all exercises

Prerequisites
none

Below you will find excerpts from events related to this course:

V Tribology

2181114, WS 18/19, 5 SWS, Open in study portal

Lecture / Practice (VÜ)

Learning Content

- Chapter 1: Friction
  adhesion, geometrical and real area of contact, Friction experiments, friction powder, tribological stressing, evironmental influences, tribological age, contact models, Simulation of contacts, roughness.
- Chapter 2: Wear
  plastic deformation at the asperity level, dissipation modes, mechanical mixing, Dynamics of the third body, running-in, running- in dynamics, shear stress.
- Chapter 3: Lubrication
  base oils, Stribeck plot, lubrication regimes (HD, EHD, mixed lubrication), additives, oil characterization, solid lubrication.
- Chapter 4: Measurement Techniques
  friction measurement, tribometer, dissipated frictional power, conventional wear measurement, continuous wear measurement(RNT)
- Chapter 5: Roughness
  profilometry, surface roughness parameters, evaluation length and filters, bearing ratio curve, measurement error
- Chapter 6: Accompanying Analysis
  multi-scale topography measurement, chemical surface analysis, structural analysis, mechanical analysis

Exercises are used for complementing and deepening the contents of the lecture as well as for answering more extensive questions raised by the students.

Workload
regular attendance: 45 hours
self-study: 195 hours

Literature

1. Fleischer, G. ; Gröger, H. ; Thum: Verschleiß und Zuverlässigkeit. 1. Auflage. Berlin : VEB-Verlag Technik, 1980
2. Persson, B.J.N.: Sliding Friction, Springer Verlag Berlin, 1998
3. M. Dienwiebel, and M. Scherge, Nanotribology in automotive industry, In:Fundamentals of Friction and Wear on the Nanoscale; Editors: E. Meyer and E. Gnecco, Springer, Berlin, 2007.
4. Scherge, M., Shakhvorostov, D., Pöhlmann, K.: Fundamental wear mechanism of metals. Wear 255, 395–400 (2003)
5. Shakhvorostov, D., Pöhlmann, K., Scherge, M.: An energetic approach to friction, wear and temperature. Wear 257, 124–130 (2004)

T 3.70 Course: Exercises for Materials Characterization [T-MACH-107685]

Responsible: Dr.-Ing. Jens Gibmeier
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Studienleistung	0	Each winter term	2

Events					
WS 18/19	2174586	Werkstoffanalytik	2 SWS	Lecture (V)	Schneider, Gibmeier
Exams					
SS 2018	76-T-MACH-107685	Exercises for Materials Characterization		Prüfung (PR)	Heilmaier, Gibmeier
WS 18/19	76-T-MACH-107685	Exercises for Materials Characterization		Prüfung (PR)	Heilmaier, Gibmeier

Competence Certificate
Regular attendance

Prerequisites
none

T 3.71 Course: Experimental Dynamics [T-MACH-105514]

Responsible: Prof. Dr.-Ing. Alexander Fidlin
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104430 - Schwerpunkt: Modellbildung und Simulation in der Dynamik
M-MACH-104442 - Schwerpunkt: Schwingungslehre

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	5	Each summer term	1

Events					
SS 2018	2162225	Experimental Dynamics	3 SWS	Lecture (V)	Fidlin
SS 2018	2162228	Übungen zu Experimentelle Dynamik	2 SWS	Practice (Ü)	Fidlin, Burgert
Exams					
SS 2018	76-T-MACH-105514	Experimental Dynamics		Prüfung (PR)	Fidlin
WS 18/19	76-T-MACH-105514	Experimental Dynamics		Prüfung (PR)	Fidlin

Competence Certificate
oral exam, 30 min.

Prerequisites
Can not be combined with Practical Training in Measurement of Vibrations (T-MACH-105373).

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-105373 - Practical Training in Measurement of Vibrations must not have been started.

Below you will find excerpts from events related to this course:

V Experimental Dynamics

2162225, SS 2018, 3 SWS, Open in study portal

Lecture (V)

Learning Content

1. Introduction
2. Measurement principles
3. Sensors as coopled multi-physical systems
4. Digital signal processing, measurements in frequency domain
5. Forced non-linear vibrations
6. Stability problems (Mathieu oscillator, friction induces vibrations)
7. Elementary rotor dynamics
8. Modal analysis

Annotation
The lectures will be accompanied by the laboratory experiments

Workload
time of attendance: 29 h
self-study: 121 h

T 3.72 Course: Experimental Fluid Mechanics [T-MACH-105512]

Responsible: Dr. Jochen Kriegseis
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2154446	Experimental Fluid Mechanics	2 SWS	Lecture (V)	Kriegseis
Exams					
SS 2018	76-T-MACH-105512	Experimental Fluid Mechanics		Prüfung (PR)	Kriegseis
WS 18/19	76-T-MACH-105512	Experimental Fluid Mechanics		Prüfung (PR)	

Competence Certificate
oral exam - 30 minutes

Prerequisites
none

Below you will find excerpts from events related to this course:

V Experimental Fluid Mechanics
2154446, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Slides, chalk board, overhead

Learning Content
This lecture focuses on experimental methods of fluid mechanics and their application to solve flow problems of practical relevance. In addition, measurement signals and data, obtained with the discussed measuring techniques, are evaluated, presented and discussed.

The lecture covers a selection of the following topics:

- measuring techniques and measureable quantities
- measurements in turbulent flows
- pressure measurements
- hot wire measurements
- optical measuring techniques
- error analysis
- scaling laws
- signal and data evaluation

Workload
regular attendance: 19,5 hours
self-study: 100,5 hours

Literature
Tropea, C., Yarin, A.L., Foss, J.F.: Springer Handbook of Experimental Fluid Mechanics, Springer 2007

Spurk, J.H.:Fluid Mechanics, Springer, 1997

T 3.73 Course: Failure Analysis [T-MACH-105724]

Responsible: Dr. Christian Greiner
Dr.-Ing. Johannes Schneider

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	2

Events					
WS 18/19	2182572	Failure Analysis	2 SWS	Lecture (V)	Greiner, Schneider
Exams					
SS 2018	76-T-MACH-105724	Failure Analysis		Prüfung (PR)	Schneider
WS 18/19	76-T-MACH-105724	Failure Analysis		Prüfung (PR)	Schneider

Competence Certificate
oral examination, ca. 30 min

Prerequisites
none

Recommendation
basic knowledge in materials science (e.g. lecture materials science I and II)

Below you will find excerpts from events related to this course:

V Failure Analysis

2182572, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Aim, procedure and content of examining failure

Examination methods

Types of failure:
Failure due to mechanical loads
Failure due to corrosion in electrolytes
Failure due to thermal loads
Failure due to tribological loads

Damage systematics

Workload
regular attendance: 21 hours
self-study: 99 hours

Literature

1. G. Lange: Systematische Beurteilung technischer Schadensfälle, 6. Auflage, WILEY-VCH Verlag, 2014, ISBN 978-3-527-68316-1, In der KIT-BIB online verfügbar!
2. A. Neidel, et al.: Handbuch Metallschäden -- REM-Atlas und Fallbeispiele zur Ursachenanalyse und Vermeidung, 2. Auflage, Hanser Verlag, 2011, ISBN 978-3-446-42966-6
3. J. Grosch, et al.: Schadenskunde im Maschinenbau: Charakteristische Schadensursachen – Analyse und Aussagen von Schadensfällen, 6. Auflage, Expert-Verlag, 2014, ISBN 978-3-816-93172-0
4. E. Wendler-Kalsch, H. Gräfen: Korrosionsschadenkunde, Springer-Verlag, 1998, ISBN 3-540-63377-4

T 3.74 Course: Failure of Structural Materials: Deformation and Fracture [T-MACH-102140]

Responsible: Prof. Dr. Peter Gumbsch
Dr. Daniel Weygand

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102582 - Schwerpunkt: Kontinuumsmechanik
M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2181711	Failure of structural materials: deformation and fracture	3 SWS	Lecture / Practice (VÜ)	Gumbsch, Weygand
Exams					
SS 2018	76-T-MACH-102140	Failure of Structural Materials: Deformation and Fracture		Prüfung (PR)	Kraft, Weygand, Gumbsch
WS 18/19	76-T-MACH-102140	Failure of Structural Materials: Deformation and Fracture		Prüfung (PR)	Weygand, Gumbsch, Kraft

Competence Certificate
oral exam ca. 30 minutes

no tools or reference materials

Prerequisites
none

Recommendation
preliminary knowlegde in mathematics, mechanics and materials science

Below you will find excerpts from events related to this course:

V Failure of structural materials: deformation and fracture

2181711, WS 18/19, 3 SWS, Open in study portal

Lecture / Practice (VÜ)

Learning Content

1. Introduction
2. linear elasticity
3. classification of stresses
4. Failure due to plasticity
   - tensile test
   - dislocations
   - hardening mechanisms
   - guidelines for dimensioning
5. composite materials
6. fracture mechanics
   - hypotheses for failure
   - linear elasic fracture mechanics
   - crack resitance
   - experimental measurement of fracture toughness
   - defect measurement
   - crack propagation
   - application of fracture mechanics
   - atomistics of fracture

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature

- Engineering Materials, M. Ashby and D.R. Jones (2nd Edition, Butterworth-Heinemann, Oxford, 1998); worth reading, relatively simple but comprehensive
- Mechanical Behavior of Materials, Thomas H. Courtney (2nd Edition, McGraw Hill, Singapur); classic on the mechanical behavior of materials, extensive and good
- Bruchvorgänge in metallischen Werkstoffen, D. Aurich (Werkstofftechnische Verlagsgesellschaft Karlsruhe), relatively simple but yet comprehensive overview of metallic materials

T 3.75 Course: Failure of Structural Materials: Fatigue and Creep [T-MACH-102139]

Responsible: Dr. Patric Gruber
Prof. Dr. Peter Gumbsch

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2181715	Failure of Structural Materials: Fatigue and Creep	2 SWS	Lecture (V)	Gruber, Gumbsch
Exams					
SS 2018	76-T-MACH-102139	Failure of Structural Materials: Fatigue and Creep		Prüfung (PR)	Gruber, Kraft, Gumbsch
WS 18/19	76-T-MACH-102139	Failure of Structural Materials: Fatigue and Creep		Prüfung (PR)	Kraft, Gumbsch, Gruber

Competence Certificate
oral exam ca. 30 minutes

no tools or reference materials

Prerequisites
none

Recommendation
preliminary knowlegde in mathematics, mechanics and materials science

Below you will find excerpts from events related to this course:

V Failure of Structural Materials: Fatigue and Creep

2181715, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1 Fatigue
1.1 Introduction
1.2 Statistical Aspects
1.3 Lifetime
1.4 Fatigue Mechanisms
1.5 Material Selection
1.6 Thermomechanical Loading
1.7 Notches and Shape Optimization
1.8 Case Study: ICE-Desaster

2 Creep
2.1 Introduction
2.2 High Temperature Plasticity
2.3 Phänomenological DEsciption of Creep
2.4 Creep Mechanisms
2.5 Alloying Effects

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature

- Engineering Materials, M. Ashby and D.R. Jones (2nd Edition, Butterworth-Heinemann, Oxford, 1998); worth reading, relatively simple but comprehensive
- Mechanical Behavior of Materials, Thomas H. Courtney (2nd Edition, McGraw Hill, Singapur); classic on the mechanical behavior of materials, extensive and good
- Bruchvorgänge in metallischen Werkstoffen, D. Aurich (Werkstofftechnische Verlagsgesellschaft Karlsruhe), relatively simple but yet comprehensive overview of metallic materials
- Fatigue of Materials, Subra Suresh (2nd Edition, Cambridge University Press); standard work on fatigue, all classes of materials, extensive, for beginners and advanced student

T 3.76 Course: Fatigue of Metallic Materials [T-MACH-105354]

Responsible: Dr. Karl-Heinz Lang
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	2

Events					
WS 18/19	2173585	Fatigue of Metallic Materials	2 SWS	Lecture (V)	Lang
Exams					
SS 2018	76-T-MACH-105354	Fatigue of Metallic Materials		Prüfung (PR)	Lang
WS 18/19	76-T-MACH-105354	Fatigue of Metallic Materials		Prüfung (PR)	Lang

Competence Certificate
Oral exam, about 20 minutes

Prerequisites
none

Recommendation
Basic knowledge in Materials Science will be helpful.

Below you will find excerpts from events related to this course:

V Fatigue of Metallic Materials

2173585, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Introduction: some interesting cases of damage

Cyclic Stress Strain Behaviour

Crack Initiation

Crack Propagation

Lifetime Behaviour under Cyclic Loading

Fatigue of Notched Components

Influence of Residual Stresses

Structural Durability

Workload
regular attendance: 21 hours
self-study: 99 hours

Literature
Lecture notes that include a list of current literature
will be distributed.

T 3.77 Course: Flows and Heat Transfer in Energy Technology [T-MACH-105403]

Responsible: Prof. Dr.-Ing. Xu Cheng
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2189910	Flows and Heat Transfer in Energy Technology	2 SWS	Lecture (V)	Cheng
WS 18/19	2189911	Übungen zu 'Strömungen und Wärmeübertragung in der Energietechnik'	1 SWS	Practice (Ü)	Cheng, Mitarbeiter
Exams					
SS 2018	76-T-MACH-105403	Flows and Heat Transfer in Energy Technology		Prüfung (PR)	Cheng
WS 18/19	76-T-MACH-105403	Flows and Heat Transfer in Energy Technology		Prüfung (PR)	Cheng

Competence Certificate
oral exam, 20 min

Prerequisites
none

Below you will find excerpts from events related to this course:

V Flows and Heat Transfer in Energy Technology

2189910, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content

1. collection of sample applications
2. heat transfer and its application
3. convective fluid dynamics and heat transfer
4. thermal radiation and its application
5. special cases

Workload
regular attendance: 21 h
self-study: 100 h

Literature

- Bahr, H.D., Stephan, K., Wärme- und Stoffübertragung, 3. Auflage Springer Verlag, 1998
- Mueller, U., Zweiphasenströmung, Vorlesungsmanuskript, Februar 2000, TH Karlsruhe
- Mueller, U., Freie Konvektion und Wärmeübertragung, Vorlesungsmanuskript, WS1993/1994, TH Karlsruhe
- W. Oldekop,"Einführung in die Kernreaktor und Kernkraftwerktechnik,"Verlag Karl Thiemig, München, 1975
- Cacuci, D.G., Badea, A.F., Energiesysteme I, Vorlesungsmanuskript, 2006, TH Karlsruhe
- Jones, O.C., Nuclear Reactor Safety Heat Transfer, Hemisphere Verlag, 1981
- Herwig, H., Moschallski, A., Wärmeübertragung, 2. Auflage, Vieweg + Teubner, 2009

T 3.78 Course: Fluid Mechanics 1&2 [T-MACH-105207]

Responsible: Prof. Dr.-Ing. Bettina Frohnapfel
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102565 - Strömungslehre

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	8	Each summer term	2

Events					
SS 2018	2154512	Fluid Mechanics I	3 SWS	Lecture / Practice (VÜ)	Frohnapfel
SS 2018	3154510	Fluid Mechanics I	3 SWS	Lecture / Practice (VÜ)	Frohnapfel
WS 18/19	2153512	Fluid Mechanics II	3 SWS	Lecture / Practice (VÜ)	Frohnapfel
WS 18/19	3153511	Fluid Mechanics II	3 SWS	Lecture / Practice (VÜ)	Frohnapfel
Exams					
SS 2018	76-T-MACH-105207	Fluid Mechanics (1+2)		Prüfung (PR)	Frohnapfel, Kriegseis
WS 18/19	76-T-MACH-105207	Fluid Mechanics (1+2)		Prüfung (PR)	

Competence Certificate
written exam 3 hours

Prerequisites
none

Below you will find excerpts from events related to this course:

V Fluid Mechanics I
2154512, SS 2018, 3 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

Blackboard, Power Point, Experiments

Learning Content
properties of fluids, surface tension, hydro- and aerostatics, kinematics, stream tube theory (compressible and incompressible), losses in pipeline systems, dimensional analysis, dimensionless numbers

Workload
regular attendance: 32 hours
self-study: 88 hours

Literature
Kundu, P.K., Cohen, K.M.: Fluid Mechanics, Elsevier, 4th Edition, 2008

Durst, F.: Fluid Mechanics: An Introduction to the Theory of Fluid Flows, Springer 2008

Batchelor, G.K.: An Introduction to Fluid Dynamics, Cambridge Mathematical Library

V Fluid Mechanics I
3154510, SS 2018, 3 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

Blackboard, Power Point, Experiments

Learning Content
properties of fluids, surface tension, hydro- and aerostatics, kinematics, stream tube theory (compressible and incompressible), losses in pipeline systems, dimensional analysis, dimensionless numbers

Workload
regular attendance: 32 hours
self-study: 88 hours

Literature
Kundu, P.K., Cohen, K.M.: Fluid Mechanics, Elsevier, 4th Edition, 2008

Durst, F.: Fluid Mechanics: An Introduction to the Theory of Fluid Flows, Springer 2008

Batchelor, G.K.: An Introduction to Fluid Dynamics, Cambridge Mathematical Library

V Fluid Mechanics II

2153512, WS 18/19, 3 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

Blackboard, Power Point, Experiments

Learning Content
tensor notation, fluid elements in continuum, Reynolds transport theorem, conservation of mass and momentum, continuity equation, constitutive law for Newtonian fluids, Navier-Stokes equations, angular momentum and energy conservation, integral form of the conservation equations, forces between fluids and solids, analytical solutions of the Navier-Stokes equations

Workload
regular attendance: 32 hours
self-study: 88 hours

Literature
Kundu, P.K., Cohen, K.M.: Fluid Mechanics, Elsevier, 4th Edition, 2008

Durst, F.: Fluid Mechanics: An Introduction to the Theory of Fluid Flows, Springer 2008

Batchelor, G.K.: An Introduction to Fluid Dynamics, Cambridge Mathematical Library

V Fluid Mechanics II

3153511, WS 18/19, 3 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

Blackboard, Power Point, Experiments

Learning Content
tensor notation, fluid elements in continuum, Reynolds transport theorem, conservation of mass and momentum, continuity equation, constitutive law for Newtonian fluids, Navier-Stokes equations, angular momentum and energy conservation, integral form of the conservation equations, forces between fluids and solids, analytical solutions of the Navier-Stokes equations

Workload
regular attendance: 32 hours
self-study: 88 hours

Literature
Kundu, P.K., Cohen, K.M.: Fluid Mechanics, Elsevier, 4th Edition, 2008

Durst, F.: Fluid Mechanics: An Introduction to the Theory of Fluid Flows, Springer 2008

Batchelor, G.K.: An Introduction to Fluid Dynamics, Cambridge Mathematical Library

T 3.79 Course: Fluid Power Systems [T-MACH-102093]

Responsible: Prof. Dr.-Ing. Marcus Geimer
Felix Pult

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul
M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	2

Events					
WS 18/19	2114093	Fluid Technology	2 SWS	Lecture (V)	Geimer, Pult
Exams					
SS 2018	76-T-MACH-102093	Fluid Power Systems		Prüfung (PR)	Geimer
WS 18/19	76T-MACH-102093	Fluid Power Systems		Prüfung (PR)	Geimer
WS 18/19	76-T-MACH-102093	Fluid Power Systems		Prüfung (PR)	Geimer

Competence Certificate
The assessment consists of a writen exam (90 minutes) taking place in the recess period. The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Fluid Technology

2114093, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
In the range of hydrostatics the following topics will be introduced:

- Hydraulic fluids
- Pumps and motors
- Valves
- Accessories
- Hydraulic circuits.

In the range of pneumatics the following topics will be introduced:

- Compressors
- Motors
- Valves
- Pneumatic circuits.

Workload

- regular attendance: 21 hours
- self-study: 92 hours

Literature
Scritum for the lecture *Fluidtechnik*

Institute of Vehicle System Technology

downloadable

T 3.80 Course: Foundry Technology [T-MACH-105157]

Responsible: Dr.-Ing. Christian Wilhelm
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	2

Events					
SS 2018	2174575	Foundry Technology	2 SWS	Lecture (V)	Wilhelm
Exams					
SS 2018	76-T-MACH-105157	Foundry Technology		Prüfung (PR)	Wilhelm
WS 18/19	76-T-MACH-105157	Foundry Technology		Prüfung (PR)	Wilhelm

Competence Certificate
oral exam; about 25 minutes

Prerequisites
M-MACH-102562 - Materials Science must be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-MACH-102562 - Materials Science must have been passed.

Below you will find excerpts from events related to this course:

V Foundry Technology
2174575, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Moulding and casting processes

Solidifying of melts

Castability

Fe-Alloys

Non-Fe-Alloys

Moulding and additive materials

Core production

Sand reclamation

Design in casting technology

Casting simulation

Foundry Processes

Workload
The workload for the lecture Foundry Technology is 120 h per semester and consists of the presence during the lecture (21 h) as well as preparation and rework time at home (99 h).

Literature
Reference to literature, documentation and partial lecture notes given in lecture

T 3.81 Course: Fuels and Lubricants for Combustion Engines [T-MACH-105184]

Responsible: Dr.-Ing. Bernhard Ulrich Kehrwald
Dr.-Ing. Heiko Kubach

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102645 - Schwerpunkt: Technik des Verbrennungsmotors
M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2133108	Fuels and Lubricants for Combustion Engines	2 SWS	Lecture (V)	Kehrwald
Exams					
SS 2018	76-T-MACH-105184	Fuels and Lubricants for Combustion Engines		Prüfung (PR)	Kehrwald
WS 18/19	76-T-MACH-105184	Fuels and Lubricants for Combustion Engines		Prüfung (PR)	

Competence Certificate
oral examination, Duration: ca. 25 min., no auxiliary means

Prerequisites
none

Below you will find excerpts from events related to this course:

V Fuels and Lubricants for Combustion Engines
2133108, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Introduction and basics

Fuels for Gasoline and Diesel engines

Hydrogen

Lubricants for Gasoline and Diesel engines

Coolants for combustion engines

Workload
regular attendance: 24 hours
self-study: 96 hours

Literature
Lecturer notes

3.82 Course: Fundamentals for Design of Motor-Vehicle Bodies I [T-MACH-102116]

Responsible: Horst Dietmar Bardehle
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	2	Each winter term	1

Events					
WS 18/19	2113814	Fundamentals for Design of Motor-Vehicles Bodies I	1 SWS	Lecture (V)	Bardehle
Exams					
SS 2018	76-T-MACH-102116	Fundamentals for Design of Motor-Vehicle Bodies I		Prüfung (PR)	Bardehle, Unrau
WS 18/19	76-T-MACH-102116	Fundamentals for Design of Motor-Vehicle Bodies I		Prüfung (PR)	Unrau, Bardehle

Competence Certificate
Oral group examination

Duration: 30 minutes

Auxiliary means: none

Prerequisites
none

Below you will find excerpts from events related to this course:

Fundamentals for Design of Motor-Vehicles Bodies I — Lecture (V)
2113814, WS 18/19, 1 SWS, Open in study portal

Learning Content
1. History and design

2. Aerodynamics

3. Design methods (CAD/CAM, FEM)

4. Manufacturing methods of body parts

5. Fastening technologie

6. Body in white / body production, body surface

Workload
regular attendance: 10,5 hours
self-study: 49,5 hours

Literature
1. Automobiltechnische Zeitschrift ATZ, Friedr. Vieweg & Sohn Verlagsges. mbH, Wiesbaden
2. Automobil Revue, Bern (Schweiz)
3. Automobil Produktion, Verlag Moderne Industrie, Landsberg

T 3.83 Course: Fundamentals for Design of Motor-Vehicle Bodies II [T-MACH-102119]

Responsible: Horst Dietmar Bardehle
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	2	Each summer term	1

Events					
SS 2018	2114840	Fundamentals for Design of Motor-Vehicles Bodies II	1 SWS	Lecture (V)	Bardehle
Exams					
SS 2018	76-T-MACH-102119	Fundamentals for Design of Motor-Vehicle Bodies II		Prüfung (PR)	Bardehle, Gauterin
WS 18/19	76-T-MACH-102119	Fundamentals for Design of Motor-Vehicle Bodies II		Prüfung (PR)	Bardehle

Competence Certificate
Oral group examination

Duration: 30 minutes

Auxiliary means: none

Prerequisites
none

Below you will find excerpts from events related to this course:

V Fundamentals for Design of Motor-Vehicles Bodies II
2114840, SS 2018, 1 SWS, Open in study portal

Lecture (V)

Learning Content
1. Body properties/testing procedures

2. External body-parts

3. Interior trim

4. Compartment air conditioning

5. Electric and electronic features

6. Crash tests

7. Project management aspects, future prospects

Workload
regular attendance: 10,5 hours
self-study: 49,5 hours

Literature
1. Automobiltechnische Zeitschrift ATZ, Friedr. Vieweg & Sohn Verlagsges. mbH, Wiesbaden
2. Automobil Revue, Bern (Schweiz)
3. Automobil Produktion, Verlag Moderne Industrie, Landsberg

T 3.84 Course: Fundamentals in the Development of Commercial Vehicles I [T-MACH-105160]

Responsible: Prof. Dr. Jörg Zürn
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	2	Each winter term	1

Events					
WS 18/19	2113812	Fundamentals in the Development of Commercial Vehicles I	1 SWS	Lecture (V)	Zürn
Exams					
SS 2018	76-T-MACH-105160	Fundamentals in the Development of Commercial Vehicles I		Prüfung (PR)	Zürn
WS 18/19	76-T-MACH-105160	Fundamentals in the Development of Commercial Vehicles I		Prüfung (PR)	Zürn

Competence Certificate
Oral group examination

Duration: 30 minutes

Auxiliary means: none

Prerequisites
none

Below you will find excerpts from events related to this course:

V Fundamentals in the Development of Commercial Vehicles I
2113812, WS 18/19, 1 SWS, Open in study portal

Lecture (V)

Learning Content
1. Introduction, definitions, history
2. Development tools
3. Complete vehicle
4. Cab, bodyshell work
5. Cab, interior fitting
6. Alternative drive systems
7. Drive train
8. Drive system diesel engine
9. Intercooled diesel engines

Workload
regular attendance: 10,5 hours
self-study: 49,5 hours

Literature
1. Marwitz, H., Zittel, S.: ACTROS -- die neue schwere Lastwagenbaureihe von Mercedes-Benz, ATZ 98, 1996, Nr. 9

2. Alber, P., McKellip, S.: ACTROS -- Optimierte passive Sicherheit, ATZ 98, 1996

3. Morschheuser, K.: Airbag im Rahmenfahrzeug, ATZ 97, 1995, S. 450 ff.

T 3.85 Course: Fundamentals in the Development of Commercial Vehicles II [T-MACH-105161]

Responsible: Prof. Dr. Jörg Zürn
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	2	Each summer term	1

Events					
SS 2018	2114844	Fundamentals in the Development of Commercial Vehicles II	1 SWS	Lecture (V)	Zürn
Exams					
SS 2018	76-T-MACH-105161	Fundamentals in the Development of Commercial Vehicles II		Prüfung (PR)	Zürn
WS 18/19	76-T-MACH-105161	Fundamentals in the Development of Commercial Vehicles II		Prüfung (PR)	Zürn

Competence Certificate
Oral group examination

Duration: 30 minutes

Auxiliary means: none

Prerequisites
none

Below you will find excerpts from events related to this course:

V Fundamentals in the Development of Commercial Vehicles II

2114844, SS 2018, 1 SWS, Open in study portal

Lecture (V)

Learning Content
1. Gear boxes of commercial vehicles
2. Intermediate elements of the drive train
3. Axle systems
4. Front axles and driving dynamics
5. Chassis and axle suspension
6. Braking System
7. Systems
8. Excursion

Workload
regular attendance: 10,5 hours
self-study: 49,5 hours

Literature

1. Schittler, M., Heinrich, R., Kerschbaum, W.: Mercedes-Benz Baureihe 500 -- neue V-Motorengeneration für schwere Nutzfahrzeuge, MTZ 57 Nr. 9, S. 460 ff., 1996

2. Robert Bosch GmbH (Hrsg.): Bremsanlagen für Kraftfahrzeuge, VDI-Verlag, Düsseldorf, 1. Auflage, 1994

3. Rubi, V., Strifler, P. (Hrsg. Institut für Kraftfahrwesen RWTH Aachen): Industrielle Nutzfahrzeugentwicklung, Schriftenreihe Automobiltechnik, 1993

T 3.86 Course: Fundamentals of Automobile Development I [T-MACH-105162]

Responsible: Dipl.-Ing. Rolf Frech
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	2	Each winter term	1

Events					
WS 18/19	2113810	Fundamentals of Automobile Development I	1 SWS	Lecture (V)	Frech
WS 18/19	2113851	Principles of Whole Vehicle Engineering I	1 SWS	Lecture (V)	Frech
Exams					
SS 2018	76-T-MACH-105162	Fundamentals of Automobile Development I		Prüfung (PR)	Frech, Unrau
WS 18/19	76-T-MACH-105162	Fundamentals of Automobile Development I		Prüfung (PR)	Frech, Unrau

Competence Certificate
Written examination

Duration: 90 minutes

Auxiliary means: none

Prerequisites
none

Below you will find excerpts from events related to this course:

V Fundamentals of Automobile Development I — Lecture (V)
2113810, WS 18/19, 1 SWS, Open in study portal

Notes
Block lecture on two days. Room and data will be published on the homepage of the institute.

Learning Content
1. Process of automobile development
2. Conceptual dimensioning and design of an automobile
3. Laws and regulations – National and international boundary conditions
4. Aero dynamical dimensioning and design of an automobile I
5. Aero dynamical dimensioning and design of an automobile II
6. Thermo-management in the conflict of objectives between styling, aerodynamic and packaging guidelines I
7. Thermo-management in the conflict of objectives between styling, aerodynamic and packaging guidelines II

Workload
regular attendance: 10,5 hours
self-study: 49,5 hours

Literature
The scriptum will be provided during the first lessons

V Principles of Whole Vehicle Engineering I — Lecture (V)
2113851, WS 18/19, 1 SWS, Open in study portal

Notes
Block lecture on two days. Room and data will be published on the homepage of the institute.

In English language.

Learning Content
1. Process of automobile development
2. Conceptual dimensioning and design of an automobile
3. Laws and regulations – National and international boundary conditions
4. Aero dynamical dimensioning and design of an automobile I
5. Aero dynamical dimensioning and design of an automobile II
6. Thermo-management in the conflict of objectives between styling, aerodynamic and packaging guidelines I
7. Thermo-management in the conflict of objectives between styling, aerodynamic and packaging guidelines II

Workload
regular attendance: 10,5 hours
self-study: 49,5 hours

Literature
The scriptum will be provided during the first lessons

T 3.87 Course: Fundamentals of Automobile Development II [T-MACH-105163]

Responsible: Dipl.-Ing. Rolf Frech
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	2	Each summer term	2

Events					
SS 2018	2114842	Fundamentals of Automobile Development II	1 SWS	Lecture (V)	Frech
SS 2018	2114860	Principles of Whole Vehicle Engineering II	1 SWS	Block lecture (BV)	Frech
Exams					
SS 2018	76-T-MACH-105163	Fundamentals of Automobile Development II		Prüfung (PR)	Frech, Unrau
WS 18/19	76-T-MACH-105163	Fundamentals of Automobile Development II		Prüfung (PR)	Unrau, Frech

Competence Certificate
Written examination

Duration: 90 minutes

Auxiliary means: none

Prerequisites
none

Below you will find excerpts from events related to this course:

V Fundamentals of Automobile Development II
2114842, SS 2018, 1 SWS, Open in study portal

Lecture (V)

Learning Content
1. Application-oriented material and production technology I
2. Application-oriented material and production technology II
3. Overall vehicle acoustics in the automobile development
4. Drive train acoustics in the automobile development
5. Testing of the complete vehicle
6. Properties of the complete automobile

Workload
regular attendance: 10,5 hours
self-study: 49,5 hours

Literature
The scriptum will be provided during the first lessons.

V Principles of Whole Vehicle Engineering II
2114860, SS 2018, 1 SWS, Open in study portal

Block lecture (BV)

Learning Content

1. Application-oriented material and production technology I
2. Application-oriented material and production technology II
3. Overall vehicle acoustics in the automobile development
4. Drive train acoustics in the automobile development
5. Testing of the complete vehicle
6. Properties of the complete automobile

Workload

regular attendance: 10,5 hours
self-study: 49,5 hours

Literature

The scriptum will be provided during the first lessons.

T 3.88 Course: Fundamentals of Catalytic Exhaust Gas Aftertreatment [T-MACH-105044]

Responsible: Prof. Dr. Olaf Deutschmann
Prof. Dr. Jan-Dierk Grunwaldt
Dr.-Ing. Heiko Kubach
Prof. Dr.-Ing. Egbert Lox

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102645 - Schwerpunkt: Technik des Verbrennungsmotors
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2134138	Fundamentals of catalytic exhaust gas aftertreatment	2 SWS	Lecture (V)	Lox, Grunwaldt, Deutschmann
Exams					
SS 2018	76-T-MACH-105044	Fundamentals of Catalytic Exhaust Gas Aftertreatment		Prüfung (PR)	Lox
WS 18/19	76-T-MACH-105044	Fundamentals of Catalytic Exhaust Gas Aftertreatment		Prüfung (PR)	

Competence Certificate
oral examination, Duration: 25 min., no auxiliary means

Prerequisites
none

Below you will find excerpts from events related to this course:

V Fundamentals of catalytic exhaust gas aftertreatment

2134138, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. kind and source of emissions
2. emission legislation
3. principal of catalytic exhaust gas aftertreatment (EGA)
4. EGA at stoichiometric gasoline engines
5. EGA at gasoline engines with lean mixtures
6. EGA at diesel engines
7. economical basic conditions for catalytic EGA

Workload
regular attendance: 36 hours
self-study: 84 hours

Literature
Lecture notes available in the lectures

1. "Environmental Catalysis" Edited by G.Ertl, H. Knötzinger, J. Weitkamp Wiley-VCH Verlag GmbH, Weinheim, 1999 ISBN 3-527-29827-4
2. "Cleaner Cars- the history and technology of emission control since the 1960s" J. R. Mondt Society of Automotive Engineers, Inc., USA, 2000 Publication R-226, ISBN 0-7680-0222-2
3. "Catalytic Air Pollution Control - commercial technology" R. M. Heck, R. J. Farrauto John Wiley & Sons, Inc., USA, 1995 ISBN 0-471-28614-1
4. "Automobiles and Pollution" P. Degobert Editions Technic, Paris, 1995 ISBN 2-7108-0676-2
5. "Reduced Emissions and Fuel Consumption in Automobile Engines" F. Schaeder, R. van Basshuysen, Springer Verlag Wien New York, 1995 ISBN 3-211-82718-8
6. "Autoabgaskatalysatoren : Grudlagen - Herstellung - Entwicklung - Recycling - Ökologie" Ch. Hagelüken und 11 Mitautoren, Expert Verlag, Renningen, 2001 ISBN 3-8169-1932-4

T 3.89 Course: Fundamentals of Combustion Engine Technology [T-MACH-105652]

Responsible: Dr.-Ing. Sören Bernhardt
Dr.-Ing. Heiko Kubach
Jürgen Pfeil
Dr.-Ing. Olaf Toedter
Dr.-Ing. Uwe Wagner

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102645 - Schwerpunkt: Technik des Verbrennungsmotors
M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	5	Each winter term	1

Events					
WS 18/19	2133123	Fundamentals of Combustion Engine Technology	2 SWS	Lecture (V)	Kubach, Wagner, Toedter, Pfeil, Bernhardt, Velji
Exams					
SS 2018	76-T-MACH-105652	Fundamentals of Combustion Engine Technology		Prüfung (PR)	Kubach
WS 18/19	76-T-MACH-105652	Fundamentals of Combustion Engine Technology		Prüfung (PR)	Kubach

Competence Certificate
oral exam, 30 min

Prerequisites
none

Below you will find excerpts from events related to this course:

V Fundamentals of Combustion Engine Technology

2133123, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Fundamentals of engine processes

Components of combustion engines

Mixture formation systems

Gasexchange systems

Injection systems

Engine Control units

Cooling systems

Transmission

Workload
regular attendance 25 h

self-study 125 h

T 3.90 Course: Fundamentals of Combustion I [T-MACH-105213]

Responsible: Prof. Dr. Ulrich Maas
Dr. Jörg Sommerer

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul
M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	1

Events					
WS 18/19	2165515	Fundamentals of Combustion I	2 SWS	Lecture (V)	Maas
WS 18/19	2165517	Fundamentals of Combustion I (Tutorial)	1 SWS	Practice (Ü)	Maas
WS 18/19	3165016	Fundamentals of Combustion I	2 SWS	Lecture (V)	Maas, Sommerer
WS 18/19	3165017	Fundamentals of Combustion I (Tutorial)	1 SWS	Practice (Ü)	Maas, Sommerer
Exams					
SS 2018	76-T-MACH-105213	Fundamentals of Combustion I		Prüfung (PR)	Maas
SS 2018	76-T-MACH-105464	Fundamentals of Combustion I		Prüfung (PR)	Maas
WS 18/19	76-T-MACH-105213	Fundamentals of Combustion I		Prüfung (PR)	Maas
WS 18/19	76-T-MACH-105464	Fundamentals of Combustion I		Prüfung (PR)	Maas

Competence Certificate
Written exam, 3 h

Prerequisites
none

Below you will find excerpts from events related to this course:

V Fundamentals of Combustion I
2165515, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Blackboard and Powerpoint presentation

Learning Content

- Ignition processes
- Fundamental concepts ans phenomena
- Experimental analysis of flames
- Conservation equations for laminar flat flames
- Chemical reactions
- Chemical kinetics mechanisms
- Laminar premixed flames
- Laminar diffusion flames

Annotation
Compulsory elective subject: 2+1 SWS and 5 LP.

Workload
Regular attendance: 22.5 h

Self-study: 97.5 h

Literature
Lecture notes,

Combustion - Physical and Chemical Fundamentals, Modeling and Simulation, Experiments, Pollutant Formation, authors: U. Maas, J. Warnatz, R.W. Dibble, Springer-Lehrbuch, Heidelberg 1996

V **Fundamentals of Combustion I (Tutorial)**
2165517, WS 18/19, 1 SWS, Open in study portal

Practice (Ü)

Literature

- Lecture Notes
- J. Warnatz; U. Maas; R.W. Dibble: Combustion, Springer, Heidelberg 1996

T 3.91 Course: Fundamentals of Combustion II [T-MACH-105325]

Responsible: Prof. Dr. Ulrich Maas
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik
M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	2

Events					
SS 2018	2100002	Fundamentals of combustion II	2 SWS	Lecture (V)	Maas
SS 2018	2166538	Fundamentals of combustion II	2 SWS	Lecture (V)	Maas
SS 2018	2166539	Übung zu Grundlagen der technischen Verbrennung II	1 SWS	Practice (Ü)	Maas
Exams					
SS 2018	76-T-MACH-105325	Fundamentals of Combustion II		Prüfung (PR)	Maas
WS 18/19	76-T-MACH-105325	Fundamentals of Combustion II		Prüfung (PR)	Maas

Competence Certificate
oral exam, 20 min

Prerequisites
none

Below you will find excerpts from events related to this course:

V Fundamentals of combustion II
2100002, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Blackboard and Powerpoint presentation

Learning Content

- Three dimensional Navier-Stokes equations for reacting flows
- Tubulent reactive flows
- Turbulent non-premixed flames
- Turbulent premixed flames
- Combustion of liquid and solid fuels
- Engine knock
- NOx formation
- Formation of hydrocarbons and soot
- Thermodynamics of combustion processes
- Transport phenomena

Workload
Regular attendance: 35 hours

Self-study: 95 hours

Literature
Lecture notes;

Combustion - Physical and Chemical Fundamentals, Modeling and Simulation,Experiments, Pollutant Formation; Authors: U. Maas, J. Warnatz, R.W. Dibble, Springer; Heidelberg, Karlsruhe, Berkley 2006

V

Fundamentals of combustion II

2166538, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Blackboard and Powerpoint presentation

Learning Content

- Three dimensional Navier-Stokes equations for reacting flows
- Tubulent reactive flows
- Turbulent non-premixed flames
- Turbulent premixed flames
- Combustion of liquid and solid fuels
- Engine knock
- NOx formation
- Formation of hydrocarbons and soot
- Thermodynamics of combustion processes
- Transport phenomena

Workload
Regular attendance: 35 hours

Self-study: 95 hours

Literature
Lecture notes;

Combustion - Physical and Chemical Fundamentals, Modeling and Simulation,Experiments, Pollutant Formation; Authors: U. Maas, J. Warnatz, R.W. Dibble, Springer; Heidelberg, Karlsruhe, Berkley 2006

V

Übung zu Grundlagen der technischen Verbrennung II

2166539, SS 2018, 1 SWS, Open in study portal

Practice (Ü)

Learning Content
Calculation and Simulation of combustion processes

Workload
regular attendance: 21 hours

Literature
Lecture notes
Buch Verbrennung - Physikalisch-Chemische Grundlagen, Modellbildung, Schadstoffentstehung, Autoren: U. Maas, J. Warnatz, R.W. Dibble, Springer-Lehrbuch, Heidelberg 1996

T 3.92 Course: Fundamentals of Energy Technology [T-MACH-105220]

Responsible: Dr. Aurelian Florin Badea
Prof. Dr.-Ing. Xu Cheng

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	8	Each summer term	1

Events					
SS 2018	2130927	Fundamentals of Energy Technology	3 SWS	Lecture (V)	Cheng, Badea
SS 2018	3190923	Fundamentals of Energy Technology	3 SWS	Lecture (V)	Badea
Exams					
SS 2018	76-T-MACH-105220	Fundamentals of Energy Technology		Prüfung (PR)	Badea, Cheng
WS 18/19	76-T-MACH-105220	Fundamentals of Energy Technology		Prüfung (PR)	Badea, Cheng

Competence Certificate
Written examination, 90 min

Prerequisites
none

Below you will find excerpts from events related to this course:

V Fundamentals of Energy Technology
2130927, SS 2018, 3 SWS, Open in study portal

Lecture (V)

Learning Content
The following relevant fields of the energy industry are covered:
- Energy demand and energy situation
- Energy types and energy mix
- Basics. Thermodynamics relevant to the energy sector
- Conventional fossil-fired power plants
- Combined Cycle Power Plants
- Cogeneration
- Nuclear energy
- Regenerative energies: hydropower, wind energy, solar energy, other energy systems
- Energy demand structures. Basics of economic efficiency and calculus. Optimization
- Energy storage
- Transport of energy
- Power generation and environment. Future of the energy industry

Workload
lectures: 45 h

preparation to exam: 195 h

V Fundamentals of Energy Technology
3190923, SS 2018, 3 SWS, Open in study portal

Lecture (V)

Learning Content
The following relevant fields of the energy industry are covered:
- Energy forms
- Thermodynamics relevant to energy industry
- Energy sources: fossil fuels, nuclear energy, renewable sources
- Energy industry in Germany, Europe and worldwide
- Power generation and environment
- Evaluation of energy conversion processes
- Thermal/electrical power plants and processes
- Transport of energy / energy carriers
- Energy storage
- Systems utilizing renewable energy sources
- Basics of economic efficiency and calculus / Optimisation
- Future of the energy industry

Workload
lectures: 45 h
preparation to exam: 195 h

T 3.93 Course: Gasdynamics [T-MACH-105533]

Responsible: Dr.-Ing. Franco Magagnato
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik
M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
SS 2018	2154200	Gasdynamics	2 SWS	Lecture (V)	Magagnato, Xiao
WS 18/19	2154200	Gasdynamics	2 SWS	Lecture (V)	Magagnato
Exams					
SS 2018	76-T-MACH-105533	Gasdynamics		Prüfung (PR)	Magagnato
WS 18/19	76-T-MACH-105533	Gasdynamics		Prüfung (PR)	

Competence Certificate
oral exam - 30 minutes

Prerequisites
none

Below you will find excerpts from events related to this course:

V Gasdynamics
2154200, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Powerpoint presentation

Learning Content
This lecture covers the following topics:

- Introduction, basics of Thermodynamics
- Governing equations of gas dynamics
- Application of the conservation equations
- The transport equations in differential form
- Stationary flow filament theory with and without shock waves
- Discussion of the energy equation: Stagnation and critical values
- Flow filament theory for variable cross-sectional areas. Flow inside a Laval nozzle

Workload
regular attendance: 21 hours

self-study: 84 hours

Literature
John, J., and Keith T. Gas Dynamics. 3rd ed.

Harlow: Prentice Hall, 2006

Rathakrishnan, E. *Gas Dynamics*. Prentice Hall of India Pvt. Ltd, 2006

T 3.94 Course: Gear Cutting Technology [T-MACH-102148]

Responsible: Dr. Markus Klaiber
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2149655	Gear Cutting Technology	2 SWS	Lecture (V)	Klaiber
Exams					
SS 2018	76-T-MACH-102148	Gear Cutting Technology		Prüfung (PR)	Schulze
WS 18/19	76-T-MACH-102148	Gear Cutting Technology		Prüfung (PR)	Schulze

Competence Certificate
Oral Exam (20 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Gear Cutting Technology
2149655, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Lecture notes will be provided in Ilias (https://ilias.studium.kit.edu/)

Learning Content
Based on the gearing theory, manufacturing processes and machine technologies for producing gearings, the needs of modern gear manufacturing will be discussed in the lecture. For this purpose, various processes for various gear types are taught which represent the state of the art in practice today. A classification in soft and hard machining and furthermore in cutting and non-cutting technologies will be made. For comprehensive understanding the processes, machine technologies, tools and applications of the manufacturing of gearings will be introduced and the current developments presented. For assessment and classification of the applications and the performance of the technologies, the methods of mass production and manufacturing defects will be discussed. Sample parts, reports from current developments in the field of research and an excursion to a gear manufacturing company round out the lecture.

Workload
regular attendance: 21 hours
self-study: 99 hours

T 3.95 Course: Global Logistics [T-MACH-105379]

Responsible: Prof. Dr.-Ing. Kai Furmans
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102644 - Schwerpunkt: Production Engineering

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	3118095	Global Logistics	2 SWS	Block lecture (BV)	Furmans, Dörr, Mittwollen
Exams					
SS 2018	76-T-MACH-105379	Global Logistics		Prüfung (PR)	Golder
WS 18/19	76-T-MACH-105379	Global Logistics		Prüfung (PR)	Golder

Competence Certificate
oral exam (20 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Global Logistics
3118095, SS 2018, 2 SWS, Open in study portal

Block lecture (BV)

Notes
The course takes place in form of a block event, i.e. all lectures will be given in one week. The dates of the lecture, i.e. the respective week, will be published on the IFL homepage.

Learning Content
Conveyor Systems

- Basic elements of conveyor systems
- Key figures
- Branching elements

- continuous/partially-continuous
- deterministic/stochastic switch

- Integration elements
- continuous/partially-continuous
- dispatching rules

Queueing Theory and Production Logistics

- Basic queueing systems
- Distributions
- M|M|1 and M|G|1 model
- Application on production logistics

Distribution Centers and Order Picking

- The location problem
- Distribution centers
- Inventory management
- Order picking

Vehicle Routing

- Types of vehicle routing problems
- Linear programming model and graph theoretic model
- Heuristics
- Supporting technologies

Optimization of Logistical Networks

- Objectives
- Cooperative strategies
- Supply chain management
- Implementation

Annotation
Attendance during lecture is required

Literature
Arnold, Dieter; Furmans, Kai : Materialfluss in Logistiksystemen; Springer-Verlag Berlin Heidelberg,

T 3.96 Course: Global Production Engineering (MEI) [T-MACH-106731]

Responsible: Prof. Dr.-Ing. Gisela Lanza
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102644 - Schwerpunkt: Production Engineering

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	3150040	Global Production Engineering (MEI)	2 SWS	Lecture (V)	Lanza, Stricker
Exams					
WS 18/19	76-T-MACH-106731	Global Production Engineering (MEI)		Prüfung (PR)	Lanza

Competence Certificate
oral exam (45 min group examination with 3 students)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Global Production Engineering (MEI)

3150040, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Target of the lecture is to depict the challenges of global operating companies and to give an overview of central aspects and methods in production planning. The lecture will regard site-related production factors and give the basic steps in site-selection, before the planning of manufacturing systems is focused. Herein, not only the planning phases are regarded, but also the methods used.

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The topics are:

- Challenges of global production
- Establishing of new production sites
- The basic steps in manufacturing system planning
- Steps and methods of factory planning
- Manufacturing and assembly planning. Assembly panning will be focused.
- Layout and material flow of production sites
- Production planning and control basics

T 3.97 Course: Handling Characteristics of Motor Vehicles I [T-MACH-105152]

Responsible: Dr.-Ing. Hans-Joachim Unrau
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2113807	Handling Characteristics of Motor Vehicles I	2 SWS	Lecture (V)	Unrau
Exams					
SS 2018	76-T-MACH-105152	Handling Characteristics of Motor Vehicles I		Prüfung (PR)	Unrau
WS 18/19	76-T-MACH-105152	Handling Characteristics of Motor Vehicles I		Prüfung (PR)	Unrau

Competence Certificate
Verbally

Duration: 30 up to 40 minutes

Auxiliary means: none

Prerequisites
none

Below you will find excerpts from events related to this course:

V Handling Characteristics of Motor Vehicles I

2113807, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. Problem definition: Control loop driver - vehicle - environment (e.g. coordinate systems, modes of motion of the car body and the wheels)

2. Simulation models: Creation from motion equations (method according to D'Alembert, method according to Lagrange, programme packages for automatically producing of simulation equations), model for handling characteristics (task, motion equations)

3. Tyre behavior: Basics, dry, wet and winter-smooth roadway

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature
1. Willumeit, H.-P.: Modelle und Modellierungsverfahren in der Fahrzeugdynamik,
B. G. Teubner Verlag, 1998

2. Mitschke, M./Wallentowitz, H.: Dynamik von Kraftfahrzeugen, Springer-Verlag, Berlin, 2004

3. Gnadler, R.; Unrau, H.-J.: Reprint collection to the lecture Handling Characteristics of Motor Vehicles I

T 3.98 Course: Handling Characteristics of Motor Vehicles II [T-MACH-105153]

Responsible: Dr.-Ing. Hans-Joachim Unrau
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2114838	Handling Characteristics of Motor Vehicles II	2 SWS	Lecture (V)	Unrau
Exams					
SS 2018	76-T-MACH-105153	Handling Characteristics of Motor Vehicles II		Prüfung (PR)	Unrau
WS 18/19	76-T-MACH-105153	Handling Characteristics of Motor Vehicles II		Prüfung (PR)	Unrau

Competence Certificate
Oral Examination

Duration: 30 up to 40 minutes

Auxiliary means: none

Prerequisites
none

Below you will find excerpts from events related to this course:

V Handling Characteristics of Motor Vehicles II

2114838, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. Vehicle handling: Bases, steady state cornering, steering input step, single sine, double track switching, slalom, cross-wind behavior, uneven roadway

2. stability behavior: Basics, stability conditions for single vehicles and for vehicles with trailer

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature
1. Zomotor, A.: Fahrwerktechnik: Fahrverhalten, Vogel Verlag, 1991
2. Mitschke, M./Wallentowitz, H.: Dynamik von Kraftfahrzeugen, Springer-Verlag, Berlin, 2004

3. Gnadler, R. Unrau, H.-J.: Reprint collection to the lecture Handling Characteristics of Motor Vehicles II

T 3.99 Course: Heat and Mass Transfer [T-MACH-105292]

Responsible: Prof. Dr.-Ing. Henning Bockhorn
Prof. Dr. Ulrich Maas

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each term	1

Events					
SS 2018	3122512	Heat and Mass Transfer	2 SWS	Lecture (V)	Bockhorn
WS 18/19	2165512	Heat and mass transfer	2 SWS	Lecture (V)	Maas
Exams					
SS 2018	76-T-MACH-105292	Heat and Mass Transfer		Prüfung (PR)	Maas
WS 18/19	76-T-MACH-105292	Heat and Mass Transfer		Prüfung (PR)	Maas

Competence Certificate
Written exam, 3 h

Prerequisites
none

Below you will find excerpts from events related to this course:

V Heat and mass transfer

2165512, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content

- Steade stade and non-stready heat transfer in homogenous and compound materials; Plates, pipe sections and sperical shells
- Molecular, equimolecular and unilateral diffusion in gases; analogies between heat conduction and mass diffusion
- Convective, forced heatr transmission in passed through pipes/channesl and circulated around plate and profiles.
- Convective mass transfer, heat-/mass transfer analogy
- Multi phase convective heat transmission (ceondensation, evaporation)
- radiative transfer of solid bodies and gases

Annotation
Compulsory elective subject: 5 LP

Workload
General attendance: 22.5 h

Self-study: 97.5 h

Literature

- Bockhorn, H.; Vorlesungsskript "Wärme- und Stoffübertragung"
- Baehr, H.-D., Stephan, K.: "Wärme- und Stoffübertragung" , Springer Verlag, 1993
- Incropera, F., DeWitt, F.: "Fundamentals of Heat and Mass Transfer" , John Wiley & Sons, 1996
- Bird, R., Stewart, W., Lightfoot, E.: "Transport Phenomena" , John Wiley & Sons, 1960

T 3.100 Course: Human Factors Engineering I [T-MACH-105518]

Responsible: Prof. Dr.-Ing. Barbara Deml
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102589 - Schwerpunkt: Produktionssysteme

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	2

Events					
WS 18/19	2109035	Human Factors Engineering I: Ergonomics	2 SWS	Lecture (V)	Deml
Exams					
SS 2018	76-T-MACH-105518	Human Factors Engineering I		Prüfung (PR)	Deml
WS 18/19	76-T-MACH-105518	Human Factors Engineering I		Prüfung (PR)	Deml

Competence Certificate
written exam, 60 minutes

The exams are only offered in German!

Prerequisites
none

Below you will find excerpts from events related to this course:

V Human Factors Engineering I: Ergonomics — Lecture (V)
2109035, WS 18/19, 2 SWS, Open in study portal

Notes
The course "Human Factors Engineering I: Ergonomics" takes place in the first half of the semester, **until 2018/12/06**, on Wednesday and Thursday.

In the second half of the semester, **beginning with 2018/12/12**, the course "Human Factors Engineering II: Work Organisation" takes place on Wednesday and Thursday.

Learning Content

1. Principles of human work
2. Behavioural-science data acquisition
3. workplace design
4. work environment design
5. work management
6. labour law and advocay groups

Workload
The amount of work accounts for 120 h (=4 ECTS).

Literature
The lecture material is available on ILIAS for download.

T 3.101 Course: Human Factors Engineering II [T-MACH-105519]

Responsible: Prof. Dr.-Ing. Barbara Deml
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102589 - Schwerpunkt: Produktionssysteme

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	2

Events					
WS 18/19	2109036	Human Factors Engineering II: Work Organisation	2 SWS	Lecture (V)	Deml
Exams					
SS 2018	76-T-MACH-105519	Human Factors Engineering II		Prüfung (PR)	Deml
WS 18/19	76-T-MACH-105519	Human Factors Engineering II		Prüfung (PR)	Deml

Competence Certificate
written exam, 60 minutes

The exams are only offered in German!

Prerequisites
none

Below you will find excerpts from events related to this course:

V Human Factors Engineering II: Work Organisation

Lecture (V)

2109036, WS 18/19, 2 SWS, Open in study portal

Notes
The course "Human Factors Engineering II: Work Organisation" takes place in the second half of the semester, **beginning with 2018/12/12**, on Wednesday and Thursday.

In the first half of the semester, **until 2018/12/06**, the course "Human Factors Engineering I: Ergonomics" takes place on Wednesday and Thursday.

Learning Content

1. Fundamentals of work organization
2. Empirical research methods
3. Individual level
    - personnel selection
    - personnel development
    - personnel assessment
    - work satisfaction/motivation
4. Group level
    - interaction and communication
    - management of employees
    - team work
5. Organizational level
    - structural organization
    - process organization
    - production organization

Workload
The amount of work is 120 h (=4 ECTS).

Literature
The lecture material is available on ILIAS for download.

T 3.102 Course: Human-Machine-Interaction [T-INFO-101266]

Responsible: Prof. Dr.-Ing. Michael Beigl
Organisation: KIT Department of Informatics
Part of: M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	6	Each summer term	2

Events					
SS 2018	24659	Human-Computer-Interaction	2 SWS	Lecture (V)	Beigl, Schankin
Exams					
SS 2018	7500048	Human-Machine-Interaction		Prüfung (PR)	Beigl
WS 18/19	7500076	Human-Machine-Interaction		Prüfung (PR)	Beigl

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-INFO-106257 - Human-Machine-Interaction must have been passed.

T 3.103 Course: Human-Machine-Interaction [T-INFO-106257]

Responsible: Prof. Dr.-Ing. Michael Beigl
Organisation: KIT Department of Informatics
Part of: M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Studienleistung	0	Each summer term	1

Events					
SS 2018	2400095	Human-Computer-Interaction	1 SWS	Practice (Ü)	Beigl, Schankin
SS 2018	24659	Human-Computer-Interaction	2 SWS	Lecture (V)	Beigl, Schankin
Exams					
SS 2018	7500121	Human-Machine-Interaction		Prüfung (PR)	Beigl

T 3.104 Course: Hybrid and Electric Vehicles [T-ETIT-100784]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	1

Events					
WS 18/19	2306321	Hybride und elektrische Fahrzeuge	2 SWS	Lecture (V)	Doppelbauer
WS 18/19	2306323	Übungen zu 2306321 Hybride und elektrische Fahrzeuge	1 SWS	Practice (Ü)	Doppelbauer
Exams					
SS 2018	7306321	Hybrid and Electric Vehicles		Prüfung (PR)	Doppelbauer
WS 18/19	7306321	Hybrid and Electric Vehicles		Prüfung (PR)	Doppelbauer

Prerequisites
none

T 3.105 Course: Hydraulic Fluid Machinery [T-MACH-105326]

Responsible: Dr. Balazs Pritz
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik
M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	8	Each summer term	1

Events					
SS 2018	2157432	Hydraulic Fluid Machinery	4 SWS	Lecture (V)	Pritz
Exams					
SS 2018	76-T-MACH-105326	Hydraulic Fluid Machinery		Prüfung (PR)	Gabi
WS 18/19	76-T-MACH-105326	Hydraulic Fluid Machinery		Prüfung (PR)	Gabi

Competence Certificate
oral exam, 40 min.

Prerequisites
None.

Below you will find excerpts from events related to this course:

V Hydraulic Fluid Machinery
2157432, SS 2018, 4 SWS, Open in study portal

Lecture (V)

Learning Content

1. Introduction
2. Basic equations
3. System analysis
4. Elementary Theory (Euler's equation of Fluid Machinery)
5. Operation and Performance Characteristics
6. Similarities, Specific Values
7. Control technics
8. Wind Turbines, Propellers
9. Cavitation
10. Hydrodynamic transmissions and converters

Workload
regular attendance: 56 hours
self-study: 150 hours

preparation for exam: 40 hours

Literature

1. Fister, W.: Fluidenergiemaschinen I & II, Springer-Verlag
2. Bohl, W.: Strömungsmaschinen I & II . Vogel-Verlag
3. Gülich, J.F.: Kreiselpumpen, Springer-Verlag
4. Pfleiderer, C.: Die Kreiselpumpen. Springer-Verlag
5. Carolus, T.: Ventilatoren. Teubner-Verlag
6. Kreiselpumpenlexikon. KSB Aktiengesellschaft
7. Zierep, J., Bühler, K.: Grundzüge der Strömungslehre. Teubner-Verlag

T 3.106 Course: I4.0 Systems platform [T-MACH-106457]

Responsible: Dipl.-Ing. Thomas Maier
Prof. Dr.-Ing. Jivka Ovtcharova

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement

Type	Credits	Recurrence	Version
Prüfungsleistung anderer Art	4	Each term	2

Events					
SS 2018	2123900	I4.0 Systems platform	4 SWS	Others (sonst.)	Ovtcharova, Maier
WS 18/19	2123900	I4.0 Systems platform	4 SWS	Project/Seminar (PJ/S)	Ovtcharova, Maier
Exams					
SS 2018	76-T-MACH-106457	I4.0 Systems platform		Prüfung (PR)	Ovtcharova
WS 18/19	76-T-MACH-106457	I4.0 Systems platform		Prüfung (PR)	Ovtcharova

Competence Certificate
Alternative exam assessment (project work)

Prerequisites
None

Annotation
Limited number of participants.

Below you will find excerpts from events related to this course:

V I4.0 Systems platform

2123900, SS 2018, 4 SWS, Open in study portal

Others (sonst.)

Notes
Number of participants limited to 20 people. There is a participant selection process.

Learning Content
Industry 4.0, IT systems for fabrication (e.g.: CAx, PDM, CAM, ERP, MES), process modelling and execution, project work in teams, practice-relevant I4.0 problems, in automation, manufacturing industry and service.

T 3.107 Course: Ignition systems [T-MACH-105985]

Responsible: Dr.-Ing. Olaf Toedter
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102645 - Schwerpunkt: Technik des Verbrennungsmotors

Type	Credits	Version
Prüfungsleistung mündlich	4	1

Events					
WS 18/19	2133125	Ignition systems	2 SWS	Lecture (V)	Toedter
Exams					
SS 2018	76-T-MACH-105985	Ignition systems		Prüfung (PR)	Koch
WS 18/19	76-T-MACH-105985	Ignition systems		Prüfung (PR)	Koch

Competence Certificate
oral exam, 20 min

Prerequisites
none

T 3.108 Course: Industrial Aerodynamics [T-MACH-105375]

Responsible: Prof. Dr.-Ing. Thomas Breitling
Prof. Dr.-Ing. Bettina Frohnapfel

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2153425	Industrial aerodynamics	2 SWS	Block lecture (BV)	Breitling
Exams					
SS 2018	76-T-MACH-105375	Industrial Aerodynamics		Prüfung (PR)	Breitling
WS 18/19	7600003	Industrial Aerodynamics		Prüfung (PR)	Breitling
WS 18/19	76-T-MACH-105375	Industrial Aerodynamics		Prüfung (PR)	Breitling

Competence Certificate
oral exam - 30 minutes

Prerequisites
none

Below you will find excerpts from events related to this course:

V Industrial aerodynamics

2153425, WS 18/19, 2 SWS, Open in study portal

Block lecture (BV)

Description
Media:

Power Point

Learning Content
This compact lecture deals with flow, mixing and combustion phenomena with significance in vehicle development. A special focus is set on the optimization of external car and truck aerodynamics, thermal comfort in passenger compartments, analyses of cooling flows and improvement of charge motion, mixing and combustion in piston engines. These fields are explained in their phenomenology, the corresponding theories are discussed and the tools for measurement and simulation are introduced and demonstrated. The focus of this lecture is on industry relevant methods for analyses and description of forces, flow structures, turbulence, flows with heat transfer and phase transition and reactive flows. In addition an introduction to modern methods in accuracy control and efficiency improvement of numerical methods for industrial use is given. The integration and interconnection of the methods in the development processes are discussed examplary.
An excursion to the Daimler AG wind tunnel and the research and development centers is planned.

- Industrial flow measurement techniques
- Flow simulation and control of numerical errors, turbulence modeling
- Cooling flows
- Flow mixing and combustation at direct injected Diesel engines
- Flow mixing and combustation at gasoline engine
- Vehicle aerodynamics
- HVAC-Systems and thermal comfort
- Aeroacoustics

Annotation
Block course with limited number of participants, registration in the secretary's office required. See details at www.istm.kit.edu

Workload
attendance: 22.5h

self-study: 100h

Literature
Script

T 3.109 Course: Information Engineering [T-MACH-102209]

Responsible: Prof. Dr.-Ing. Jivka Ovtcharova
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement

Type	Credits	Recurrence	Version
Prüfungsleistung anderer Art	3	Each term	2

Events					
SS 2018	2122014	Information Engineering	2 SWS	Seminar (S)	Ovtcharova, Mitarbeiter
Exams					
SS 2018	76-T-MACH-102209	Information Engineering		Prüfung (PR)	Ovtcharova
WS 18/19	76-T-MACH-102209	Information Engineering		Prüfung (PR)	Ovtcharova

Competence Certificate
Alternative exam assessment (written composition and speech)

Prerequisites
None

T 3.110 Course: Information Processing in Mechatronic Systems [T-MACH-105328]

Responsible: Prof. Dr.-Ing. Michael Kaufmann
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102817 - Schwerpunkt: Informationstechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	1

Events					
WS 18/19	2105022	Information Processing in Mechatronic Systems	2 SWS	Lecture (V)	Kaufmann
Exams					
SS 2018	76-T-MACH-105328	Information Processing in Mechatronic Systems		Prüfung (PR)	Hagenmeyer
WS 18/19	76-T-MACH-105328	Information Processing in Mechatronic Systems		Prüfung (PR)	Hagenmeyer

Competence Certificate
Written exam (Duration: 1 h)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Information Processing in Mechatronic Systems

2105022, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Information processing components – consisting of sensors, actors, hardware and software – are of essential importance for the implementation of mechatronic functions.

Based on requirements on information processing in mechatronic systems typical hardware and software solutions are examined. Characteristics, advantages, disadvantages and application areas are discussed. Solutions are examined regarding real-time capabilities, dependability, safety and fault tolerance. Bus communication in mechatronic systems is examined. Description methods and several approaches of functional description are considered. An approach on the development of information processing components is developed. Lecture topics are complemented by practical examples.

Outline:

- Requirements on information processing components,
- Characteristics of information processing components
- Real-time capabilities, dependability, safety and fault tolerance
- Architectures of information processing components
- Communication in mechatronic systems
- Descriptive models und functional description
- Development of information processing components

Software quality

Workload
General attendance: 21 h

Self-study: 99 h

Literature

- Marwedel, P.: Eingebettete Systeme. Springer: 2007.
- Teich, J: Digitale Hard-, Software-Systeme. Springer: 2007.
- Wörn, H., Brinkschulte, U.: Echtzeitsysteme: Grundlagen, Funktionsweisen, Anwendungen. Springer, 2005.
- Zöbel, D.: Echtzeitsysteme: Grundlagen der Planung. Springer, 2008.

T 3.111 Course: Information Processing in Sensor Networks [T-INFO-101466]

Responsible: Prof. Dr.-Ing. Uwe Hanebeck
Organisation: KIT Department of Informatics
Part of: M-MACH-102817 - Schwerpunkt: Informationstechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	6	Irregular	1

Events					
WS 18/19	24102	Information Processing in Sensor Networks	3 SWS	Lecture (V)	Noack, Mayer, Hanebeck
Exams					
SS 2018	7500011	Information Processing in Sensor Networks		Prüfung (PR)	Hanebeck, Noack
WS 18/19	7500030	Information Processing in Sensor Networks		Prüfung (PR)	Noack, Hanebeck

T 3.112 Course: Information Systems and Supply Chain Management [T-MACH-102128]

Responsible: Dr. Christoph Kilger
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement
M-MACH-102817 - Schwerpunkt: Informationstechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	3	Each summer term	2

Events					
SS 2018	2118094	Information Systems in Logistics and Supply Chain Management	2 SWS	Lecture (V)	Kilger
Exams					
SS 2018	76-T-MACH-102128	Information Systems and Supply Chain Management		Prüfung (PR)	Mittwollen
WS 18/19	76T-MACH-102128	Information Systems and Supply Chain Management		Prüfung (PR)	Mittwollen
WS 18/19	76-T-MACH-102128	Information Systems and Supply Chain Management		Prüfung (PR)	Mittwollen

Competence Certificate
The assessment consists of an oral exam (20 min.) taking place in the recess period according to § 4 paragraph 2 Nr. 2 of the examination regulation.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Information Systems in Logistics and Supply Chain Management
2118094, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

presentations

Learning Content
1) Overview of logistics systems and processes

2) Basic concepts of information systems and information technology

3) Introduction to IS in logistics: Overview and applications

4) Detailed discussion of selected SAP modules for logistics support

Annotation
none

Workload
regular attendance: 21 hours
self-study: 99 hours

Literature
Stadtler, Kilger: Supply Chain Management and Advanced Planning, Springer, 4. Auflage 2008

T 3.113 Course: Integrated Information Systems for Engineers [T-MACH-102083]

Responsible: Prof. Dr.-Ing. Jivka Ovtcharova
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement
M-MACH-102589 - Schwerpunkt: Produktionssysteme
M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	2

Events					
SS 2018	2121001	Integrated Information Systems for engineers	3 SWS	Lecture (V)	Ovtcharova, Mitarbeiter
Exams					
SS 2018	76-T-MACH-102083	Integrated Information Systems for Engineers		Prüfung (PR)	Ovtcharova
WS 18/19	76-T-MACH-102083	Integrated Information Systems for Engineers		Prüfung (PR)	Ovtcharova

Competence Certificate
Oral examination 20 min.

Prerequisites
None

Below you will find excerpts from events related to this course:

V Integrated Information Systems for engineers

2121001, SS 2018, 3 SWS, Open in study portal

Lecture (V)

Learning Content

- Information systems, information management
- CAD, CAP and CAM systems
- PPS, ERP and PDM systems
- Knowledge management and ontology
- Process modeling

Workload
Regular attendance: 31,5 hours, self-study: 108 hours

Literature
Lecture slides

T 3.114 Course: Integrated Production Planning in the Age of Industry 4.0 [T-MACH-108849]

Responsible: Prof. Dr.-Ing. Gisela Lanza
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102589 - Schwerpunkt: Produktionssysteme

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	8	Each summer term	1

Events					
SS 2018	2150660	Integrated Production Planning in the Age of Industry 4.0	6 SWS	Lecture / Practice (VÜ)	Lanza
Exams					
WS 18/19	76-T-MACH-108849	Integrated Production Planning in the Age of Industry 4.0		Prüfung (PR)	Lanza

Competence Certificate
Oral Exam (40 min)

Prerequisites
"T-MACH-109054 - Integrierte Produktionsplanung im Zeitalter von Industrie 4.0" as well as "T-MACH-102106 Integrierte Produktionsplanung" must not be commenced.

Below you will find excerpts from events related to this course:

V Integrated Production Planning in the Age of Industry 4.0
2150660, SS 2018, 6 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

Lecture notes will be provided in Ilias (https://ilias.studium.kit.edu/)

Learning Content
Integrated production planning in the age of industry 4.0 will be taught in the context of this engineering science lecture. In addition to a comprehensive introduction to Industry 4.0, the following topics will be addressed at the beginning of the lecture:

- Basics, history and temporal development of production
- Integrated production planning and integrated digital engineering
- Principles of integrated production systems and further development with Industry 4.0

Building on this, the phases of integrated production planning are taught in accordance with VDI Guideline 5200, whereby special features of parts production and assembly are dealt with in the context of case studies:

- Factory planning system
- Definition of objectives
- Data collection and analysis
- Concept planning (structural development, structural dimensioning and rough layout)
- Detailed planning (production planning and control, fine layout, IT systems in an industry 4.0 factory)
- Preparation and monitoring of implementation
- Start-up and series support

The lecture contents are rounded off by numerous current practical examples with a strong industry 4.0 reference. Within the exercises the lecture contents are deepened and applied to specific problems and tasks.

Workload
MACH:
regular attendance: 63 hours
self-study: 177 hours
WING:
regular attendance: 63 hours
self-study: 207 hours

Literature
Lecture Notes

T 3.115 Course: Integrative Strategies in Production and Development of High Performance Cars [T-MACH-105188]

Responsible: Karl-Hubert Schlichtenmayer
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	1

Events					
SS 2018	2150601	Integrative Strategies in Production and Development of High Performance Cars	2 SWS	Lecture (V)	Schlichtenmayer
Exams					
SS 2018	76-T-MACH-105188	Integrative Strategies in Production and Development of High Performance Cars		Prüfung (PR)	Lanza
WS 18/19	76-T-MACH-105188	Integrative Strategies in Production and Development of High Performance Cars		Prüfung (PR)	Lanza

Competence Certificate
Written Exam (60 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Integrative Strategies in Production and Development of High Performance Cars Lecture (V)

2150601, SS 2018, 2 SWS, Open in study portal

Description
Media:

Lecture notes will be provided in Ilias (https://ilias.studium.kit.edu/).

Learning Content
The lecture deals with the technical and organizational aspects of integrated development and production of sports cars on the example of Porsche AG. The lecture begins with an introduction and discussion of social trends. The deepening of standardized development processes in the automotive practice and current development strategies follow. The management of complex development projects is a first focus of the lecture. The complex interlinkage between development, production and purchasing are a second focus. Methods of analysis of technological core competencies complement the lecture. The course is strongly oriented towards the practice and is provided with many current examples.

The main topics are:

- Introduction to social trends towards high performance cars
- Automotive Production Processes
- Integrative R&D strategies and holistic capacity management
- Management of complex projects
- Interlinkage between R&D, production and purchasing
- The modern role of manufacturing from a R&D perspective
- Global R&D and production
- Methods to identify core competencies

Workload
regular attendance: 21 hours
self-study: 99 hours

Literature
Lecture Slides

T 3.116 Course: Intellectual Property Rights and Strategies in Industrial Companies [T-MACH-105442]

Responsible: Frank Zacharias
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement
M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each term	1

Events					
SS 2018	2147160	Patente und Patentstrategien in innovativen Unternehmen	2 SWS	Block lecture (BV)	Zacharias
WS 18/19	2147161	Intellectual Property Rights and Strategies in Industrial Companies	2 SWS	Lecture (V)	Zacharias
Exams					
SS 2018	76-T-MACH-105442	Intellectual Property Rights and Strategies in Industrial Companies		Prüfung (PR)	Albers
WS 18/19	76-T-MACH-105442	Intellectual Property Rights and Strategies in Industrial Companies		Prüfung (PR)	Albers

Competence Certificate
oral exam (20 min)

Prerequisites
none

Recommendation
None

Below you will find excerpts from events related to this course:

V Intellectual Property Rights and Strategies in Industrial Companies **Lecture (V)**
2147161, WS 18/19, 2 SWS, Open in study portal

Learning Content
The lecture will describe the requirements to be fulfilled and how protection is obtained for patents, design rights and trademarks, with a particular focus on Germany, Europe and the EU. Active, project-integrated intellectual property management and the use of strategic patenting by technologically oriented companies will also be discussed. Furthermore, the significance of innovations and intellectual property for both business and industry will be demonstrated using practical examples, before going on to consider the international challenges posed by intellectual property and current trends in the sector.

Within the context of licensing and infringement, insight will be provided as to the relevance of communication, professional negotiations and dispute resolution procedures, such as mediation for example. The final item on the agenda will cover those aspects of corporate law that are relevant to intellectual property.

Lecture overview:

1. Introduction to intellectual property
2. The profession of the patent attorney
3. Filing and obtaining intellectual property rights
4. Patent literature as a source of knowledge and information
5. The law regarding employee inventions
6. Active, project-integrated intellectual property management
7. Strategic patenting
8. The significance of intellectual property
9. International challenges and trends
10. Professional negotiations and dispute resolution procedures
11. Aspects of corporate law

Workload
regular attendance: 21 h

self-study: 99 h

T 3.117 Course: Introduction into Mechatronics [T-MACH-100535]

Responsible: Moritz Böhland
Dr.-Ing. Maik Lorch
PD Dr.-Ing. Markus Reischl

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	6	Each winter term	2

Events					
WS 18/19	2105011	Introduction into Mechatronics	3 SWS	Lecture (V)	Reischl, Lorch, Böhland
Exams					
SS 2018	76-T-MACH-100535	Introduction into Mechatronics		Prüfung (PR)	Hagenmeyer
WS 18/19	76-T-MACH-100535	Introduction into Mechatronics		Prüfung (PR)	Hagenmeyer

Competence Certificate
Oral exam (Duration: 2h)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Introduction into Mechatronics

2105011, WS 18/19, 3 SWS, Open in study portal

Lecture (V)

Learning Content
Part I: Modeling and optimization (Prof. Bretthauer)

Introduction
Architecture of mechatronic systems
Modeling of mechatronic systems
Optimization of mechatronic systems
Perspective

Part II: Development and design (Prof. Albers)

Introduction
Development method for mechatronic products

Examples

Workload
regular attendance: 31.5 h

self-study: 148 h

Literature
Heimann, B.; Gerth, W.; Popp, K.: Mechatronik. Leipzig: Hanser, 1998
Isermann, R.: Mechatronische Systeme - Grundlagen. Berlin: Springer, 1999
Roddeck, W.: Einführung in die Mechatronik. Stuttgart: B. G. Teubner, 1997
Töpfer, H.; Kriesel, W.: Funktionseinheiten der Automatisierungstechnik. Berlin: Verlag Technik, 1988
Föllinger, O.: Regelungstechnik. Einführung in die Methoden und ihre Anwendung. Heidelberg: Hüthig, 1994
Bretthauer, G.: Modellierung dynamischer Systeme. Vorlesungsskript. Freiberg: TU Bergakademie, 1997

T 3.118 Course: Introduction into the Multi-Body Dynamics [T-MACH-105209]

Responsible: Prof. Dr.-Ing. Wolfgang Seemann
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul
M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102820 - Schwerpunkt: Mechatronik
M-MACH-104430 - Schwerpunkt: Modellbildung und Simulation in der Dynamik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	5	Each summer term	2

Events					
SS 2018	2162235	Introduction into the multi-body dynamics	3 SWS	Lecture (V)	Seemann
Exams					
SS 2018	76-T-MACH-105209	Introduction into the Multi-Body Dynamics		Prüfung (PR)	Seemann
WS 18/19	76-T-MACH-105209	Introduction into the Multi-Body Dynamics		Prüfung (PR)	Seemann

Competence Certificate
Written examination, 180 min.

Prerequisites
none

Recommendation
Engineering Mechanics III/IV

Below you will find excerpts from events related to this course:

V Introduction into the multi-body dynamics

2162235, SS 2018, 3 SWS, Open in study portal

Lecture (V)

Learning Content
The role of multibody systems in engineering, kinematics of a single rigid body, Kinematics of multibody systems, rotation matrix, angular velocity, derivatives in different reference systems, holonomic and non-holonomic constraints, Newton-Euler's equations, principle of d'Alembert, principle of virtuel power, Lagrange's equations, Kane's equations, structure of the equations of motion

Workload
time of attendance: 21,5h; self-study: 98h

Literature
Wittenburg, J.: Dynamics of Systems of Rigid Bodies, Teubner Verlag, 1977
Roberson, R. E., Schwertassek, R.: Dynamics of Multibody Systems, Springer-Verlag, 1988
de Jal'on, J. G., Bayo, E.: Kinematik and Dynamic Simulation of Multibody System.
Kane, T.: Dynamics of rigid bodies.

T 3.119 Course: Introduction to Ceramics [T-MACH-100287]

Responsible: Prof. Dr. Michael Hoffmann
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	6	Each winter term	1

Events					
WS 18/19	2125757	Introduction to Ceramics	3 SWS	Lecture (V)	Hoffmann
Exams					
SS 2018	76-T-MACH-100287	Introduction to Ceramics		Prüfung (PR)	Hoffmann, Schell, Wagner
WS 18/19	76-T-MACH-100287	Introduction to Ceramics		Prüfung (PR)	Hoffmann, Schell, Wagner

Competence Certificate
The assessment consists of an oral exam (30 min) taking place at a specific date.

The re-examination is offered at a specific date.

Prerequisites
None

Below you will find excerpts from events related to this course:

V Introduction to Ceramics
2125757, WS 18/19, 3 SWS, Open in study portal

Lecture (V)

Description
Media:

Slides for the lecture:

available under http://www.iam.kit.edu/km

Learning Content
After a short introduction to interatomic bonding, fundamental concepts of crystallography, the stereographic projection and the most important symmetry elements will be given. Different types of crystal structures are explained and the relevance of imperfections are analysed with respect to the mechanical and electrical properties of ceramics. Then, the impact of surfaces, interfaces and grain boundaries for the preparation, microstructural evolution and the resulting properties is discussed. Finally, an introduction is given to ternary phase diagrams.

The second part of the course covers structure, preparation and application aspects of nonmetallic inorganic glasses, followed by an introduction to the properties and processing methods of fine-grained technical powders. The most relevant shaping methods, such as pressing, slip casting, injection moulding and extrusion are introduced. Subsequently, the basics of science of sintering and the mechanisms for normal and abnormal grain growth are discussed. Mechanical properties of ceramics are analysed using basic principles of linear elastic fracture mechanics, Weibull statistics, concepts for subcritical crack growth and creep models to explain the behaviour at elevated temperatures. Furthermore it is demonstrated that mechanical properties can be siginificantly enhanced by various types of microstructural toughening mechanisms. The electronic and ionic conductivity of ceramic materials are explained based on defect-chemical considerations and band structure models. Finally, the characteristics of a dielectric, pyroelectric, and piezoelectric behaviour is discussed.

Workload
regular attendance: 45 hours
self-study: 135 hours

Literature

- H. Salmang, H. Scholze, "Keramik", Springer
- Kingery, Bowen, Uhlmann, "Introduction To Ceramics", Wiley
- Y.-M. Chiang, D. Birnie III and W.D. Kingery, "Physical Ceramics", Wiley
- S.J.L. Kang, "Sintering, Densification, Grain Growth & Microstructure", Elsevier

T 3.120 Course: Introduction to Nonlinear Vibrations [T-MACH-105439]

Responsible: Prof. Dr.-Ing. Alexander Fidlin
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104442 - Schwerpunkt: Schwingungslehre

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	7	Each winter term	1

Events					
WS 18/19	2162247	Introduction to Nonlinear Vibrations	2 SWS	Lecture (V)	Fidlin
WS 18/19	2162248	Introduction into the nonlinear vibrations (Tutorial)	2 SWS	Practice (Ü)	Fidlin, Drozdetskaya
Exams					
SS 2018	76-T-MACH-105439	Introduction to Nonlinear Vibrations		Prüfung (PR)	Fidlin
WS 18/19	76-T-MACH-105439	Introduction to Nonlinear Vibrations		Prüfung (PR)	Fidlin

Competence Certificate
oral exam, 30 min.

Prerequisites
none

Recommendation
Vibration theory, Mathematical Methods of Vibration Theory, Dynamic Stability

Below you will find excerpts from events related to this course:

V Introduction to Nonlinear Vibrations

2162247, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content

- dynamic systems
- basic ideas of asymptotic methods
- perturbation methods: Linstedt-Poincare, averaging, multiple scales
- limit cycles
- nonlinear resonance
- basics of the bifurcation analysis, bifurcation diagrams
- types of bifurcations
- discontinuous systems
- dynamic chaos

Workload
time of attendance: 39 h
self-study: 201 h

Literature

- Hagedorn P. Nichtlineare Schwingungen. Akademische Verlagsgesellschaft, 1978.
- Nayfeh A.H., Mook D.T. Nonlinear Oscillation. Wiley, 1979.
- Thomsen J.J. Vibration and Stability, Order and Chaos. McGraw-Hill, 1997.
- Fidlin A. Nonlinear Oscillations in Mechanical Engigeering. Springer, 2005.
- Bogoliubov N.N., Mitropolskii Y.A. Asymptotic Methods in the Theory of Nonlinear Oscillations. Gordon and Breach, 1961.
- Nayfeh A.H. Perturbation Methods. Wiley, 1973.
- Sanders J.A., Verhulst F. Averaging methods in nonlinear dynamical systems. Springer-Verlag, 1985.
- Blekhman I.I. Vibrational Mechanics. World Scientific, 2000.
- Moon F.C. Chaotic Vibrations – an Introduction for applied Scientists and Engineers. John Wiley & Sons, 1987.

V Introduction into the nonlinear vibrations (Tutorial)

2162248, WS 18/19, 2 SWS, Open in study portal

Practice (Ü)

Workload
time of attendance: 10,5h; self-study: 20h

T 3.121 Course: Introduction to Nuclear Energy [T-MACH-105525]

Responsible: Prof. Dr.-Ing. Xu Cheng
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2189903	Introduction to Nuclear Energy	2 SWS	Lecture (V)	Cheng
Exams					
SS 2018	76-T-MACH-105525	Introduction to Nuclear Energy		Prüfung (PR)	Cheng
WS 18/19	76-T-MACH-105525	Introduction to Nuclear Energy		Prüfung (PR)	Cheng

Competence Certificate
oral exam, 30 min

Prerequisites
none

T 3.122 Course: Introduction to Numerical Fluid Dynamics [T-MACH-105515]

Responsible: Dr. Balazs Pritz
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Studienleistung	4	Each winter term	1

Events					
WS 18/19	2157444	Introduction to numerical fluid dynamics	2 SWS	Practical course (P)	Pritz
Exams					
SS 2018	76-T-MACH-105515	Introduction to Numerical Fluid Dynamics		Prüfung (PR)	Gabi
WS 18/19	76-T-MACH-105515	Introduction to Numerical Fluid Dynamics		Prüfung (PR)	Gabi

Competence Certificate
Certificate of participation

Prerequisites
none

Below you will find excerpts from events related to this course:

V Introduction to numerical fluid dynamics

2157444, WS 18/19, 2 SWS, Open in study portal

Practical course (P)

Learning Content
In the lab, the components of the cycle of computational fluid dynamics are worked through. In the first instance moderately complicated geometries will be generated and meshed. After the configuration and running the calculation, the results are presented and evaluated in a visualization software. While in the first part of the course these steps are worked out under guidance, calculation cycles are carried out independently in the second part. The test cases are discussed in detail and allow to strengthen the affinity to the fluid dynamics.

Content:

1. Brief introduction into Linux
2. Mesh generation with ICEMCFD
3. Data visualisation and interpretation with Tecplot
4. Handling of the flow solver SPARC
5. Self-designed calculation: flat plate
6. Introduction to unsteady calculations: flow around a circular cylinder

Annotation
In winter term 2012/2013:
Course: Computational Methods in Fluid Mechanics (Exercise) [2157442]

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature
Lecture notes/handout

T 3.123 Course: Introduction to the Finite Element Method [T-MACH-105320]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Dr.-Ing. Tom-Alexander Langhoff

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102582 - Schwerpunkt: Kontinuumsmechanik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	5	Each summer term	2

Events					
SS 2018	2162282	Introduction to the Finite Element Method	2 SWS	Lecture (V)	Langhoff, Böhlke
Exams					
SS 2018	76-T-MACH-105320	Introduction to the Finite Element Method		Prüfung (PR)	Böhlke, Langhoff
WS 18/19	76-T-MACH-105320	Introduction to the Finite Element Method		Prüfung (PR)	Böhlke, Langhoff

Competence Certificate
written exam (90 min). Additives as announced

Prerequisites
none

Recommendation
The contents of the lectures "Advanced methods in strength of materials" and "Mathematical methods in strength of materials" are considered to be known.

Below you will find excerpts from events related to this course:

V Introduction to the Finite Element Method

2162282, SS 2018, 2 SWS, Open in study portal **Lecture (V)**

Learning Content

- introduction and motivation
- elements of tensor calculus
- the initial-boundary-value-problem of linear thermoconductivity
- the boundary-value-problem of linear elastostatic
- spatial discretization for 3D problems
- solution of the boundary-value-problem of elastostatic
- numerical solution of linear systems
- element types
- error estimation

Workload
regular attendance: 42 hours
self-study: 108 hours

Literature
lecture notes
Fish, J., Belytschko, T.: A First Course in Finite Elements, Wiley 2007 (includes an introduction into ABAQUS)

T 3.124 Course: IT-Fundamentals of Logistics [T-MACH-105187]

Responsible: Prof. Dr.-Ing. Frank Thomas
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement
M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102817 - Schwerpunkt: Informationstechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2118183	IT-Fundamentals of Logistics	2 SWS	Lecture (V)	Thomas
Exams					
SS 2018	76-T-MACH-105187	IT-Fundamentals of Logistics		Prüfung (PR)	Furmans, Mittwollen
WS 18/19	76-T-MACH-105187	IT-Fundamentals of Logistics		Prüfung (PR)	Furmans, Mittwollen

Competence Certificate
The assessment consists of an oral exam (30min) taking place in the recess period according to § 4 paragraph 2 Nr. 2 of the examination regulation.

Prerequisites
none

Annotation
1) Detailed script can be downloaded online (www.tup.com), updated and enhanced annually.

2) CD-ROM with chapters and exercises at the end of the semester available from the lecturer, also updated and enhanced annually.

Below you will find excerpts from events related to this course:

V IT-Fundamentals of Logistics
2118183, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
The rapid development of information technology influences business processes drastically.
A strategic IT-orientation for an enterprise without a critical appreciation of worldwide IT-development (where the half-life value of IT for logistic systems knowledge is less than 3 years) is dangerous. The pressure of costs is always in focus. For this purpose the contents of this course, as well as the detailed script will be continuously revised, and the influences on business processes will be shown in practical examples.

Focuses:

- **System architecture in Material Flow Control Systems (MFCS)**

A guiding principle for a new system architecture for MFC systems is the consideration of making new standardized, functional groups available for re-usability.

- **Design and application of innovative Material Flow Control Systems (MFCS)**

The most important task of the MFCS is the commissioning of conveying systems with driving commands in a way that optimally utilizes the facility and serves the logistics processes on schedule.

- **Identification of goods – Application in Logistics**

Along with business processes, coded information is the link between the flow of information and the flow of materials, and contributes to error prevention in the communication between people and machines.

- **Data communication in Intra-logistics**

Information describes the content of a message that is of value to the recipient.
The recipient can be both a human and a machine.

- **Business processes for Intra-logistics – Software follows function!**

If the business processes from Goods Incoming to Goods Outgoing are adapted with reusable building blocks then capabilities become visible. Against this background the consideration becomes apparent, how, through an innovative software architecture, a reusable building-block based framework can be made.
Therefore applies: Software follows function. And only if all project requirements are documented in the planing phase, and supported together in an inter-disciplinary team - consisting of logistics planners, the customers (users) and the implementation leader (IL).

- **Software development in accordance with industrial standards**

Today's development of object-oriented software, and the increasing penetration of industrial software production with this technology, makes it possible to create system designs that already offer these opportunities in their facility - both for a high degree of reuse and for easier adaptability.
In software development, object-oriented methods are used to improve the productivity, maintainability and software quality. An important aspect of object-orientation is: the objects used are primarily intended to depict the real world.

Annotation
1) Detailed script can be downloaded online (www.tup.com), updated and enhanced annually.
2) CD-ROM with chapters and exercises at the end of the semester available from the lecturer, also updated and enhanced annually.

Workload
regular attendance: 21 hours
self-study: 99 hours

T 3.125 Course: Lab Computer-Aided Methods for Measurement and Control [T-MACH-105341]

Responsible: Prof. Dr.-Ing. Christoph Stiller
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102817 - Schwerpunkt: Informationstechnik

Type	Credits	Recurrence	Version
Studienleistung	4	Each winter term	1

Events					
WS 18/19	2137306	Lab Computer-aided methods for measurement and control	3 SWS	Practical course (P)	Stiller, Richter
Exams					
SS 2018	76-T-MACH-105341	Lab Computer-Aided Methods for Measurement and Control		Prüfung (PR)	Stiller
WS 18/19	76-T-MACH-105341	Lab Computer-Aided Methods for Measurement and Control		Prüfung (PR)	Stiller

Competence Certificate
Colloquia

Prerequisites
none

Below you will find excerpts from events related to this course:

V Lab Computer-aided methods for measurement and control

2137306, WS 18/19, 3 SWS, Open in study portal

Practical course (P)

Learning Content
1. Digital technology
2. Digital storage oscilloscope and digital spectrum analyzer
3. Supersonic computer tomography
4. Lighting and image acquisition
5. Digital image processing
6. Image interpretation
7. Control synthesis and simulation
8. Robot: Sensors
9 Robot: Actuating elements and path planning
The lab comprises 9 experiments.

Workload
120 hours

Literature
Instructions to the experiments are available on the institute's website

T 3.126 Course: Laboratory Exercise in Energy Technology [T-MACH-105331]

Responsible: Prof. Dr.-Ing. Hans-Jörg Bauer
Prof. Dr. Ulrich Maas
Heiner Wirbser

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik

Type	Credits	Recurrence	Version
Studienleistung	4	Each term	1

Events					
SS 2018	2171487	Laboratory Exercise in Energy Technology	3 SWS	Practical course (P)	Bauer, Wirbser, Maas
WS 18/19	2171487	Laboratory Exercise in Energy Technology	3 SWS	Practical course (P)	Wirbser, Bauer, Maas
Exams					
SS 2018	76-T-MACH-105331	Laboratory Exercise in Energy Technology		Prüfung (PR)	Bauer, Maas, Wirbser
WS 18/19	76-T-MACH-105331	Laboratory Exercise in Energy Technology		Prüfung (PR)	Bauer, Maas, Wirbser

Competence Certificate
1 report, approx. 12 pages

Discussion of the documented results with the assistents

Prerequisites
none

Below you will find excerpts from events related to this course:

V Laboratory Exercise in Energy Technology

2171487, SS 2018, 3 SWS, Open in study portal

Practical course (P)

Learning Content

- Micro gas turbine
- Several test rigs for the investigation of heat transfer at thermally high loaded components
- Optimization of components of the internal air and oil system
- Characterization of spray nozzles
- Investigation of pollutant and noise emission as well as reliability and material deterioration
- Exhaust gas treatment
- Exhaust gas turbocharger
- Cooling Tower
- Heatpump
- Plant oil stove
- Heat capacity
- Wood combustion

Annotation
Online registration within the first two weeks of the lecture periode at: http://www.its.kit.edu

Workload
regular attendance: 42h
self-study: 78h

V **Laboratory Exercise in Energy Technology** **Practical course (P)**
2171487, WS 18/19, 3 SWS, Open in study portal

Learning Content

- Micro gas turbine
- Several test rigs for the investigation of heat transfer at thermally high loaded components
- Optimization of components of the internal air and oil system
- Characterization of spray nozzles
- Investigation of pollutant and noise emission as well as reliability and material deterioration
- Exhaust gas treatment
- Exhaust gas turbocharger
- Cooling Tower
- Heatpump
- Plant oil stove
- Heat capacity
- Wood combustion

Annotation
Online registration within the first two weeks of the lecture periode at: http://www.its.kit.edu

Workload
regular attendance: 42h
self-study: 78h

T 3.127 Course: Laboratory Laser Materials Processing [T-MACH-102154]

Responsible: Dr.-Ing. Johannes Schneider
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Studienleistung	4	Each term	2

Events					
SS 2018	2183640	Laboratory "Laser Materials Processing"	3 SWS	Practical course (P)	Schneider, Pfleging
WS 18/19	2183640	Laboratory "Laser Materials Processing"	3 SWS	Practical course (P)	Schneider, Pfleging
Exams					
SS 2018	76-T-MACH-102154	Laboratory Laser Materials Processing		Prüfung (PR)	Schneider
WS 18/19	76-T-MACH-102154	Laboratory Laser Materials Processing		Prüfung (PR)	Schneider

Competence Certificate
The assessment consists of a colloquium for every single experiment and an overall final colloquium incl. an oral presentation of 20 min.

Prerequisites
none

Recommendation
basic knowledge of physics, chemistry and material science

The attendance to one of the courses Physical Basics of Laser Technology (2181612) or Laser Application in Automotive Engineering (2182642) is strongly recommended.

Annotation
The maximum number of students is 12 per semester.

Below you will find excerpts from events related to this course:

V Laboratory "Laser Materials Processing"
2183640, SS 2018, 3 SWS, Open in study portal

Practical course (P)

Description
Media:

lecture notes via ILIAS

Learning Content
The laboratory compromises 8 half-day experiments, which address the following laser processing topics of metals, ceramics and polymers:

• safety aspects

• surface hardening and remelting

• melt and reactive cutting

• surface modification by dispersing or alloying

• welding

• surface texturing

• metrology

There are used CO_2-, excimer-, Nd:YAG- and high power diode-laser sources within the laboratory.

Annotation
The maximum number of students is 12 per semester.

Workload
regular attendance: 34 hours
self-study: 86 hours

Literature
W.T. Silfvast: Laser Fundamentals, 2008, Cambrigde University Press

W.M. Steen: Laser Materials Processing, 2010, Springer

V **Laboratory "Laser Materials Processing"** **Practical course (P)**
2183640, WS 18/19, 3 SWS, Open in study portal

Description
Media:

lecture notes via ILIAS

Learning Content
The laboratory compromises 8 half-day experiments, which address the following laser processing topics of metals, ceramics and polymers:

• safety aspects

• surface hardening and remelting

• melt and reactive cutting

• surface modification by dispersing or alloying

• welding

• surface texturing

• metrology

There are used CO2-, excimer-, Nd:YAG- and high power diode-laser sources within the laboratory.

Annotation
The maximum number of students is 12 per semester.

Workload
regular attendance: 34 hours
self-study: 86 hours

Literature
W.T. Silfvast: Laser Fundamentals, 2008, Cambrigde University Press

W.M. Steen: Laser Materials Processing, 2010, Springer

T 3.128 Course: Laboratory Mechatronics [T-MACH-105370]

Responsible: Dr.-Ing. Maik Lorch
Prof. Dr.-Ing. Wolfgang Seemann
Prof. Dr.-Ing. Christoph Stiller

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102817 - Schwerpunkt: Informationstechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Studienleistung	4	Each winter term	3

Events					
WS 18/19	2105014	Laboratory mechatronics	3 SWS	Practical course (P)	Seemann, Stiller, Lorch, Burgert
Exams					
SS 2018	76-T-MACH-105370	Laboratory Mechatronics		Prüfung (PR)	Stiller, Seemann
WS 18/19	76-T-MACH-105370	Laboratory Mechatronics		Prüfung (PR)	Stiller, Seemann

Competence Certificate
certificate of successful attendance

Prerequisites
None

Below you will find excerpts from events related to this course:

V Laboratory mechatronics

2105014, WS 18/19, 3 SWS, Open in study portal

Practical course (P)

Learning Content
Part I
Control, programming and simulation of robots
CAN-Bus communication
Image processing / machine vision
Dynamic simulation of robots in ADAMS

Part II
Solution of a complex problem in team work

Workload
regular attendance: 33.5 h

self-study: 88.5 h

Literature
Manuals for the laboratory course on Mechatronics

T 3.129 Course: Laboratory Production Metrology [T-MACH-108878]

Responsible: Dr.-Ing. Benjamin Häfner
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102589 - Schwerpunkt: Produktionssysteme
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung anderer Art	4	Each summer term	1

Events					
SS 2018	2150550	Laboratory Production Metrology	3 SWS	Practical course (P)	Häfner
Exams					
WS 18/19	76-T-MACH-108878	Laboratory Production Metrology		Prüfung (PR)	Häfner

Competence Certificate
Alternative test achievement:
Group presentation

Prerequisites
none

Below you will find excerpts from events related to this course:

V Laboratory Production Metrology

2150550, SS 2018, 3 SWS, Open in study portal

Practical course (P)

Description
Lecture notes will be provided in Ilias (https://ilias.studium.kit.edu/). Additional reference to literature will be provided, as well.

Notes
Place, dates and deadlines for the lecture will be published on the homepage http://www.wbk.kit.edu/studium-und-lehre.php.

Learning Content
During this course, students get to know measurement systems that are used in a production system. In the age of Industry 4.0, sensors are becoming more important. Therefore, the application of in-line measurement technology such as machine vision and non-destructive testing is focussed. Additionally, laboratory based measurement technologies such as computed tomography are addressed. The student learn the theoretical background as well as practical applications for industrial examples. The students use sensors by themselves during the course. Additionally, they are trained on how to integrate sensors in production processes and how to analyze measurement data with suitable software. The following topics are addressed:

- Classification and examples for different measurement technologies in a production environment
- Machine vision with optical sensors
- Information fusion based on optical measurements
- Robot-based optical measurements
- Non-destructive testing by means of acoustic measurements
- Coodinate measurement technology
- Industrial computed tomography
- Measurement uncertainty evaluation
- Analysis of production data by means of data mining

Workload
regular attendance: 31,5 hours
self-study: 88,5 hours

T 3.130 Course: Laser in Automotive Engineering [T-MACH-105164]

Responsible: Dr.-Ing. Johannes Schneider
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	2

Events					
SS 2018	2182642	Laser in automotive engineering	2 SWS	Lecture (V)	Schneider
Exams					
SS 2018	76-T-MACH-105164	Laser in Automotive Engineering		Prüfung (PR)	Schneider
WS 18/19	76-T-MACH-105164	Laser in Automotive Engineering		Prüfung (PR)	Schneider

Competence Certificate
oral examination (30 min)

no tools or reference materials

Prerequisites
It is not possible, to combine this brick with brick Physical Basics of Laser Technology [T-MACH-109084] and brick Physical Basics of Laser Technology [T-MACH-102102]

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-102102 - Physical Basics of Laser Technology must not have been started.

Recommendation
preliminary knowlegde in mathematics, physics and materials science

Below you will find excerpts from events related to this course:

V Laser in automotive engineering

2182642, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

lecture notes via ILIAS

Learning Content
Based on a short description of the physical basics of laser technology the lecture reviews the most important high power lasers and their various applications in automotive engineering. Furthermore the application of laser light in metrology and safety aspects will be addressed.

- physical basics of laser technology
- laser beam sources (Nd:YAG-, CO2-, high power diode-laser)
- beam properties, guiding and shaping
- basics of materials processing with lasers
- laser applications in automotive engineering
- economical aspects
- savety aspects

Annotation
It is allowed to select only one of the lectures "Laser in automotive engineering" (2182642) or "Physical basics of laser technology" (2181612) during the Bachelor and Master studies.

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature
W. M. Steen: Laser Material Processing, 2010, Springer

W. T. Silfvast: Laser Fundamentals, 2008, Cambridge University Press

T 3.131 Course: Leadership and Conflict Management [T-MACH-105440]

Responsible: Hans Hatzl
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2110017	Leadership and Conflict Management (in German)	2 SWS	Lecture (V)	Hatzl
Exams					
SS 2018	76-T-MACH-105440	Leadership and Conflict Management		Prüfung (PR)	Deml
WS 18/19	76-T-MACH-105440	Leadership and Conflict Management		Prüfung (PR)	Deml

Competence Certificate
oral exam (approx. 30 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Leadership and Conflict Management (in German)

2110017, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content

1. Introduction to the course
2. Goal definition and goal achievement
3. Management techniques within planning
4. Communication and information
5. Decision-making
6. Leadership and co-operation
7. Self management
8. Conflict management
9. Case studies

Workload
The amount of work accounts for 120 h (=4 ECTS).

Literature
Handout and literature are available on ILIAS for download.

T 3.132 Course: Leadership and Management Development [T-MACH-105231]

Responsible: Dipl. -Psych. Dipl. -Kfm. Andreas Ploch
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2145184	Leadership and Product Development	2 SWS	Lecture (V)	Ploch
Exams					
SS 2018	76-T-MACH-105231	Leadership and Management Development		Prüfung (PR)	Albers
WS 18/19	76-T-MACH-105231	Leadership and Management Development		Prüfung (PR)	Albers

Competence Certificate
oral exam (20 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Leadership and Product Development — Lecture (V)
2145184, WS 18/19, 2 SWS, Open in study portal

Learning Content
Leadership theories

Management tools

Communication as management tool

Change management

Management development and MD-Programs

Assessment center and management audits

Team work, team development und team roles

Intercultural competences

Leadership and ethics, Corporate Governance

Executive Coaching

Lectures of industrial experts

Workload
regular attendance: 21 h

self-study: 99 h

T 3.133 Course: Lightweight Engineering Design [T-MACH-105221]

Responsible: Prof. Dr.-Ing. Albert Albers
Norbert Burkardt
Sven Revfi

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	2

Events					
SS 2018	2146190	Lightweight Engineering Design	2 SWS	Lecture (V)	Albers, Burkardt
Exams					
SS 2018	76-T-MACH-105221	Lightweight Engineering Design		Prüfung (PR)	Albers, Burkardt
WS 18/19	76-T-MACH-105221	Lightweight Engineering Design		Prüfung (PR)	Albers

Competence Certificate
Written examination (60 min)

Prerequisites
None

Below you will find excerpts from events related to this course:

V Lightweight Engineering Design

2146190, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Beamer

Learning Content
General aspects of leightweight design, lightweight strategies, construction methods, design principles, lightweight construction, stiffening techniques, lightweight materials, virtual product engineering, bionics, joining techniques, validation, recycling

Additionally, guest speakers from industry will present lightweight design from an practical point of view.

Annotation
Lecture slides are available via eLearning-Platform ILIAS.

Workload
regular attendance: 21 h

self-study: 99 h

Literature
Klein, B.: Leichtbau-Konstruktion. Vieweg & Sohn Verlag, 2007

Wiedemann, J.: Leichtbau: Elemente und Konstruktion, Springer Verlag, 2006

Harzheim, L.: Strukturoptimierung. Grundlagen und Anwendungen. Verlag Harri Deutsch, 2008

T 3.134 Course: Machine Dynamics [T-MACH-105210]

Responsible: Prof. Dr.-Ing. Carsten Proppe
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul
M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102820 - Schwerpunkt: Mechatronik
M-MACH-104430 - Schwerpunkt: Modellbildung und Simulation in der Dynamik
M-MACH-104442 - Schwerpunkt: Schwingungslehre

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	5	Each summer term	1

Events					
SS 2018	2161224	Machine Dynamics	2 SWS	Lecture (V)	Proppe
SS 2018	2161225	Machine Dynamics (Tutorial)	1 SWS	Practice (Ü)	Proppe, Koebele
Exams					
SS 2018	76-T-MACH-105210	Machine Dynamics		Prüfung (PR)	Proppe
WS 18/19	76-T-MACH-105210	Machine Dynamics		Prüfung (PR)	Proppe

Competence Certificate
written exam, 180 min.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Machine Dynamics
2161224, SS 2018, 2 SWS, Open in study portal — **Lecture (V)**

Learning Content
1. Introduction

2. Machine as mechatronic system
3. Rigid rotors: equations of motion, transient and stationary motion, balancing
4. Flexible rotors: Laval rotor (equations of motion, transient and stationary behavior, critical speed, secondary effects), refined models)
5. Slider-crank mechanisms: kinematics, equations of motion, mass and power balancing

Workload
Lectures and exercices: 32 h

Studies: 118 h

Literature
Biezeno, Grammel: Technische Dynamik, 2. Edition, 1953

Holzweißig, Dresig: Lehrbuch der Maschinendynamik, 1979

Dresig, Vulfson: Dynamik der Mechanismen, 1989

V Machine Dynamics (Tutorial)
2161225, SS 2018, 1 SWS, Open in study portal — **Practice (Ü)**

Learning Content
Excercises related to the lecture

T 3.135 Course: Machine Dynamics II [T-MACH-105224]

Responsible: Prof. Dr.-Ing. Carsten Proppe
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102820 - Schwerpunkt: Mechatronik
M-MACH-104430 - Schwerpunkt: Modellbildung und Simulation in der Dynamik
M-MACH-104442 - Schwerpunkt: Schwingungslehre

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2162220	Machine Dynamics II	2 SWS	Lecture (V)	Proppe
Exams					
SS 2018	76-T-MACH-105224	Machine Dynamics II		Prüfung (PR)	Proppe
WS 18/19	76-T-MACH-105224	Machine Dynamics II		Prüfung (PR)	Proppe

Competence Certificate
oral exam, 30 min.

Prerequisites
none

Recommendation
Machine Dynamics

Below you will find excerpts from events related to this course:

V Machine Dynamics II

2162220, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
- hydrodynamic bearings
- rotating shafts in hydrodynamic bearings
- belt drives
- virbation of turbine blades

Workload
Lectures: 20 h

Self-studies: 100 h

Literature
R. Gasch, R. Nordmann, H. Pfützner: Rotordynamik, Springer, 2006

T 3.136 Course: Machine Tools and Industrial Handling [T-MACH-109055]

Responsible: Prof. Dr.-Ing. Jürgen Fleischer
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102589 - Schwerpunkt: Produktionssysteme
M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	8	Each winter term	1

Events					
WS 18/19	2149902	Machine Tools and Industrial Handling	6 SWS	Lecture / Practice (VÜ)	Fleischer
Exams					
WS 18/19	76-T-MACH-109055	Machine Tools and Industrial Handling		Prüfung (PR)	Fleischer

Competence Certificate
Oral exam (40 minutes)

Prerequisites
"T-MACH-102158 - Werkzeugmaschinen und Handhabungstechnik" must not be commenced.

Below you will find excerpts from events related to this course:

V Machine Tools and Industrial Handling

2149902, WS 18/19, 6 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

Lecture notes will be provided in Ilias (https://ilias.studium.kit.edu/)

Notes
Lectures on Mondays and Wednesdays, tutorial on Thursdays.
The tutorial dates will announced in the first lecture.

Learning Content
The lecture gives an overview of the construction, use and application of machine tools and industrial handling equipment. In the course of the lecture a well-founded and practice-oriented knowledge for the selection, design and evaluation of machine tools is conveyed. First, the main components of the machine tools are systematically explained and their design principles as well as the integral machine tool design are discussed. Subsequently, the use and application of machine tools will be demonstrated using typical machine examples. Based on examples from current research and industrial applications, the latest developments are discussed, especially concerning the implementation of Industry 4.0.

The individual topics are:

- Frames and frame components
- Feed axes
- Spindles
- Peripheral equipment
- Control unit
- Metrological evaluation and machine testing
- Process monitoring
- Maintenance of machine tools
- Safety assessment of machine tools
- Machine examples

Annotation
None

Workload
MACH:
regular attendance: 63 hours
self-study: 177 hours
WiIng:/TVWL
regular attendance: 63 hours
self-study: 207 hours

T 3.137 Course: Machine Vision [T-MACH-105223]

Responsible: Dr. Martin Lauer
Prof. Dr.-Ing. Christoph Stiller

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102817 - Schwerpunkt: Informationstechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	8	Each winter term	2

Events					
WS 18/19	2137308	Machine Vision	4 SWS	Lecture / Practice (VÜ)	Lauer, Quehl
Exams					
SS 2018	76-T-MACH-105223	Machine Vision		Prüfung (PR)	Stiller, Lauer
WS 18/19	76-T-MACH-105223	Machine Vision		Prüfung (PR)	Stiller, Lauer

Competence Certificate
Type of Examination: written exam

Duration of Examination: 60 minutes

Prerequisites
None

Below you will find excerpts from events related to this course:

V Machine Vision

2137308, WS 18/19, 4 SWS, Open in study portal

Lecture / Practice (VÜ)

Learning Content

The lecture on machine vision covers basic techniques of machine vision. It focuses on the following topics:

image preprocessing

edge and corner detection

curve and parameter fitting

color processing

image segmentation

camera optics

pattern recognition

deep learning

Image preprocessing:

The chapter on image processing discusses techniques and algorithms to filter and enhance the image quality. Starting from an analysis of the typical phenomena of digital camera based image capturing the lecture introduces the Fourier transform and the Shannon-Nyquist sampling theorem. Furthermore, it introduces gray level histogram based techniques including high dynamic range imaging. The disussion of image convolution and typical filters for image enhancement concludes the chapter.

Edge and corner detection:

Gray level edges and gray level corners play an important role in machine vision since gray level edges often reveal valueable information about the boundaries and shape of objects. Gray level corners can be used as feature points since they can be identified easily in other images. This chapter introduces filters and algorithms to reveal gray level edges and gray level corners like the Canny edge detector and the Harris corner detector.

Curve and parameter fitting:

In order to describe an image by means of geometric primitives (e.g. lines, circles, ellipses) instead of just pixels robust curve and parameter fitting algorithms are necessary. The lecture introduces and discusses the Hough transform, total least sum of squares parameter fitting as well as robust alternatives (M-estimators, least trimmed sum of squares, RANSAC)

Color processing:

The short chapter on color processing discusses the role of color information in machine vision and introduces various models for color understanding and color representation. It concludes with the topic of color consistency.

Image Segmentation:

Image segmentation belongs to the core techniques of machine vision. The goal of image segmentation is to subdivide the image into several areas. Each area shares common properties, i.e. similar color, similar hatching, or similar semantic interpretation. Various ideas for image segmentation exist which can be used to create more or less complex algorithms. The lecture introduces the most important approaches ranging from the simpler algorithms like region growing, connected components labeling, and morphological operations up to highly flexible and powerful methods like level set approaches and random fields.

Camera optics:

The content of an image is related by the optics of the camera to the 3-dimensional world. In this chapter the lecture introduces optical models that describe the relationship between the world and the image including the pinhole camera model, the thin lens model, telecentric cameras, and catadioptric sensors. Furthermore, the lecture introduces camera calibration methods that can be used to determine the optical mapping of a real camera.

Pattern recognition:

Pattern recognition aims at recognizing semantic information in an image, i.e. not just analyzing gray values or colors of pixels but revealing which kind of object is shown by the pixels. This task goes beyond classical measurement theory and enters the large field of artificial intelligence. Rather than just being developped and optimized by a programmer, the algorithms are adapting themselves to their specific task using training algorithms that are based on large collections of sample images.

The chapter of pattern recognition introduces standard techniques of pattern recognition in the context of image understanding like the support vector machine (SVM), decision trees, ensemble and boosting techniques. It combines those classifiers with powerful feature representation techniques like the histogram of oriented gradients (HOG) features, locally binary patterns (LBP), and Haar features.

Deep learning:

Throughout recent years standard pattern recognition technqiues have more and more been outperformed by deep learning techniques. Deep learning is based on artificial neural networks, a very generic and powerful form of a classifier. The lecture introduces multi layer perceptrons as the most relevant form of artificial neural networks, discusses training algorithms and strategies to achieve powerful classifiers based on deep learning including deep auto encoders, convolutional networks, and multi task learning, among others.

Workload

240 hours

Literature

Main results are summarized in the slides that are made available as pdf-files. Further recommendations will be presented in the lecture.

T 3.138 Course: Machines and Processes [T-MACH-105208]

Responsible: Prof. Dr.-Ing. Hans-Jörg Bauer
Dr.-Ing. Heiko Kubach
Prof. Dr. Ulrich Maas
Dr. Balazs Pritz

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102566 - Maschinen und Prozesse

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	7	Each term	1

Events					
SS 2018	3134140	Machines and Processes	4 SWS	Lecture / Practice (VÜ)	Bauer, Maas, Kubach, Pritz
WS 18/19	2185000	Machines and Processes	4 SWS	Lecture / Practice (VÜ)	Bauer, Kubach, Maas, Pritz
Exams					
SS 2018	76-T-MACH-105208	Machines and Processes, Prerequisite		Prüfung (PR)	Kubach, Gabi, Bauer, Maas
WS 18/19	76-T-MACH-105208	Machines and Processes		Prüfung (PR)	Kubach, Maas, Gabi, Bauer

Competence Certificate
written exam (duration: 120 min)

Prerequisites
Taking part at the exam is possible only when lab course has been successfully completed

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-105232 - Machines and Processes, Prerequisite must have been passed.

Below you will find excerpts from events related to this course:

V Machines and Processes

2185000, WS 18/19, 4 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

slides to download

Documentation of the labcourse

Learning Content
basics of thermodynamics

thermal fluid machines

- steam turbunes
- gas turbines
- combined-cycle plants
- turbines and compressors
- aircraft engines

hydraulic fluid machines

- oerating performance
- characterization
- control
- cavitation
- wind turbines, propellers

internal combustion engines

- characteristic parameters
- engine parts
- kinematics
- engine processes
- emissions

Annotation
Lab course and lecture take place in summer and winter semester.

In the SS the lecture is held in English. The lab course is always bilingual.

Workload
regular attendance: 48 h, self-study: 160 h

T 3.139 Course: Machines and Processes, Prerequisite [T-MACH-105232]

Responsible: Prof. Dr.-Ing. Hans-Jörg Bauer
Dr.-Ing. Heiko Kubach
Prof. Dr. Ulrich Maas
Dr. Balazs Pritz

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102566 - Maschinen und Prozesse

Type	Credits	Recurrence	Version
Studienleistung	0	Each term	1

Events					
SS 2018	2187000	Machinery and Processes	1 SWS	Practical course (P)	Bauer, Kubach, Maas, Pritz
WS 18/19	2187000	Machinery and Processes	1 SWS	Practical course (P)	Bauer, Kubach, Maas
Exams					
SS 2018	76-T-MACH-105232	Machines and Processes, Prerequisite		Prüfung (PR)	Kubach, Gabi, Bauer, Maas
WS 18/19	76-T-MACH-105232	Machines and Processes, Prerequisite		Prüfung (PR)	Kubach, Maas, Bauer, Gabi

Competence Certificate
successful completed training course

Prerequisites
none

Below you will find excerpts from events related to this course:

V Machinery and Processes

2187000, SS 2018, 1 SWS, Open in study portal

Practical course (P)

Description
Media:

slides to download

Documentation of the labcourse

Learning Content
basics of thermodynamics

thermal fluid machines

- steam turbunes
- gas turbines
- combined-cycle plants
- turbines and compressors
- aircraft engines

hydraulic fluid machines

- oerating performance
- characterization
- control
- cavitation
- wind turbines, propellers

internal combustion engines

- characteristic parameters
- engine parts
- kinematics
- engine processes
- emissions

Annotation
Lab course and lecture take place in summer and winter semester.

In the SS the lecture is held in English. The lab course is always bilingual.

Workload
regular attendance: 48 h, self-study: 160 h

V **Machinery and Processes** **Practical course (P)**
2187000, WS 18/19, 1 SWS, Open in study portal

Description
Media:

slides to download

Documentation of the labcourse

Learning Content
basics of thermodynamics

thermal fluid machines

- steam turbunes
- gas turbines
- combined-cycle plants
- turbines and compressors
- aircraft engines

hydraulic fluid machines

- oerating performance
- characterization
- control
- cavitation
- wind turbines, propellers

internal combustion engines

- characteristic parameters
- engine parts
- kinematics
- engine processes
- emissions

Annotation
Lab course and lecture take place in summer and winter semester.

In the SS the lecture is held in English. The lab course is always bilingual.

Workload
regular attendance: 48 h, self-study: 160 h

T 3.140 Course: Manufacturing Technology [T-MACH-102105]

Responsible: Prof. Dr.-Ing. Volker Schulze
Dr.-Ing. Frederik Zanger

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102589 - Schwerpunkt: Produktionssysteme
M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	8	Each winter term	3

Events					
WS 18/19	2149657	Manufacturing Technology	6 SWS	Lecture / Practice (VÜ)	Schulze, Zanger
Exams					
SS 2018	76-T-MACH-102105	Manufacturing Technology		Prüfung (PR)	Schulze
WS 18/19	76-T-MACH-102105	Manufacturing Technology		Prüfung (PR)	Schulze
WS 18/19	76-T-MACH-102105-Mündl.	Manufacturing Technology		Prüfung (PR)	Schulze

Competence Certificate
Written Exam (180 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Manufacturing Technology

2149657, WS 18/19, 6 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

Lecture notes will be provided in ilias (https://ilias.studium.kit.edu/).

Learning Content
The objective of the lecture is to look at manufacturing technology within the wider context of production engineering, to provide an overview of the different
manufacturing processes and to impart detailed process knowledge of the common processes. The lecture covers the basic principles of manufacturing technology and
deals with the manufacturing processes according to their classification into main groups regarding technical and economic aspects. The lecture is completed with topics such as process chains in manufacturing.
The following topics will be covered:

- Quality control
- Primary processing (casting, plastics engineering, sintering, additive manufacturing processes)
- Forming (sheet-metal forming, massive forming, plastics engineering)
- Cutting (machining with geometrically defined and geometrically undefined cutting edges, separating, abrading)
- Joining
- Coating
- Heat treatment and surface treatment
- Process chains in manufacturing

This lucture provides an excursion to an industry company.

Annotation
None

Workload
regular attendance: 63 hours
self-study: 177 hours

Literature
Lecture Notes

T 3.141 Course: Material Flow in Logistic Systems [T-MACH-102151]

Responsible: Prof. Dr.-Ing. Kai Furmans
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102589 - Schwerpunkt: Produktionssysteme
M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung anderer Art	6	Each winter term	2

Events					
WS 18/19	2117051	Material flow in logistic systems	4 SWS	Others (sonst.)	Furmans
Exams					
SS 2018	76-T-MACH-102151	Material Flow in Logistic Systems		Prüfung (PR)	Furmans
WS 18/19	76-T-MACH-102151	Material Flow in Logistic Systems		Prüfung (PR)	Furmans

Competence Certificate
The assessment (Prüfungsleistung anderer Art) consists of the following assignments:

- 40% assessment of the final case study as individual performance,
- 60% semester evaluation which includes working on 5 case studies and defending those (For both assessment types, the best 4 of 5 tries count for the final grade.):
  - 40% assessment of the result of the case studies as group work,
  - 20% assessment of the oral examination during the case study colloquiums as individual performance.

A detailed description of the learning control can be found under Annotations.

Prerequisites
none

Recommendation
Recommended elective subject: Probability Theory and Statistics

Annotation
Students are divided into groups for this course. Five case studies are carried out in these groups. The results of the group work during the lecture period are presented and evaluated in writing. In the oral examination during the case study colloquiums, the understanding of the result of the group work and the models dealt with in the course is tested. The participation in the oral defenses is compulsory and will be controlled. For the written submission the group receives a common grade, in the oral defense each group member is evaluated individually.

After the lecture period, there is the final case study. This case study contains the curriculum of the whole semester. The students work individually on this case study which takes place at a predefined place and time (duration: 4h).

Below you will find excerpts from events related to this course:

V Material flow in logistic systems

2117051, WS 18/19, 4 SWS, Open in study portal **Others (sonst.)**

Description
Students are divided into groups for this course. Five case studies are carried out in these groups. The results of the group work during the lecture period are presented and evaluated in writing. In the oral examination during the case study colloquiums, the understanding of the result of the group work and the models dealt with in the course is tested. The participation in the oral defenses is compulsory and will be controlled. For the written submission the group receives a common grade, in the oral defense each group member is evaluated individually.

After the lecture period, there is the final case study. This case study contains the curriculum of the whole semester. The students work individually on this case study which takes place at a predefined place and time (duration: 4h).

Media: Presentations, black board, book, video recordings

Learning Content

- Elements of material flow systems (conveyor elements, fork, join elements)
- Models of material flow networks using graph theory and matrices
- Queueing theory, calculation of waiting time, utilization
- Warehouseing and order-picking
- Shuttle systems
- Sorting systems
- Simulation
- Calculation of availability and reliability
- Value stream analysis

Annotation
none

Workload
Regular attendance: 30 h

Self-study: 100 h

Group work: 50 h

Literature
Arnold, Dieter; Furmans, Kai : Materialfluss in Logistiksystemen; Springer-Verlag Berlin Heidelberg, 2009

T 3.142 Course: Materials and Processes for Body Lightweight Construction in the Automotive Industry [T-MACH-105166]

Responsible: Dr. Stefan Kienzle
Dr. Dieter Steegmüller

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2149669	Materials and Processes for Body Lightweight Construction in the Automotive Industry	2 SWS	Lecture (V)	Steegmüller, Kienzle
Exams					
SS 2018	76-T-MACH-105166	Materials and Processes for Body Lightweight Construction in the Automotive Industry		Prüfung (PR)	Fleischer
WS 18/19	76-T-MACH-105166	Materials and Processes for Body Lightweight Construction in the Automotive Industry		Prüfung (PR)	Schulze

Competence Certificate
Oral Exam (20 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Materials and Processes for Body Lightweight Construction in the Automotive Industry

Lecture (V)

2149669, WS 18/19, 2 SWS, Open in study portal

Description
Media:

Lecture notes will be provided in Ilias (https://ilias.studium.kit.edu/)

Notes
The lecture is a block course. An application in Ilias is mandatory.

Learning Content
The objective of the lecture is to build up an overview of the relevant materials and processes for the production of a lightweight body. This includes both the actual production and the joining for the body. The lecture covers the different lightweight approaches and possible fields of application in the automotive industry. The methods are discussed with practical examples from the automotive industry.
The following topics will be covered:

- lightweight designs
- aluminium and steel for lightweight construction
- fiber-reinforced plastics by the RTM and SMC process
- joining of steel and aluminium (clinching, riveting, welding)
- bonding
- coating
- finishing
- quality assurance
- virtual factory

Workload
regular attendance: 21 hours
self-study: 99 hours

T 3.143 Course: Materials Characterization [T-MACH-107684]

Responsible: Dr.-Ing. Jens Gibmeier
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	6	Each winter term	2

Events					
WS 18/19	2174586	Werkstoffanalytik	2 SWS	Lecture (V)	Schneider, Gibmeier
Exams					
SS 2018	76-T-MACH-107684	Materials Characterization		Prüfung (PR)	Heilmaier, Gibmeier
WS 18/19	76-T-MACH-107684	Materials Characterization		Prüfung (PR)	Heilmaier, Gibmeier

Competence Certificate
Oral exam, about 25 minutes

Prerequisites
T-MACH-107685 - Exercises for Materials Characterization must be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-107685 - Exercises for Materials Characterization must have been passed.

T 3.144 Course: Materials of Lightweight Construction [T-MACH-105211]

Responsible: Prof. Dr.-Ing. Kay Weidenmann
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2174574	Materials for Lightweight Construction	2 SWS	Lecture (V)	Weidenmann
Exams					
SS 2018	76-T-MACH-105211	Materials of Lightweight Construction		Prüfung (PR)	Weidenmann
WS 18/19	76-T-MACH-105211	Materials of Lightweight Construction		Prüfung (PR)	Weidenmann

Competence Certificate
Oral exam, about 25 minutes

Prerequisites
none

Recommendation
Materials Science I/II

Below you will find excerpts from events related to this course:

V Materials for Lightweight Construction

2174574, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content

Introduction

Constructive, production-orientied and material aspects of lightweight construction

Aluminium-based alloys

Aluminium wrought alloys

Aluminium cast alloys

Magnesium-based alloys

Magnesium wrought alloys

Magnesium cast alloys

Titanium-based alloys

Titanium wrought alloys

Titanium cast alloys

High-strength steels

High-strength structural steels,

Heat-treatable steels, press-hardening and hardenable steels

Composites - mainly PMC

Matrices

Reinforcements

Basic mechanical principles of composites

Hybrid composites

Special materials for lightweight design

Beryllium alloys

Metallic Glasses

Applications

Workload

The workload for the lecture “Materials for Lightweight Construction” is 120 h per semester and consists of the presence during the lectures (24 h), preparation and rework time at home (48 h) and preparation time for the oral exam (48 h).

Literature

Presentation slides and additional lecture notes are handed out during the lecture, additional literature recommendations given

T 3.145 Course: Materials Science and Engineering III [T-MACH-105301]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	8	Each winter term	1

Events					
WS 18/19	2173553	Materials Science and Engineering III	4 SWS	Lecture (V)	Heilmaier, Lang
WS 18/19	2173554	Übungen zu Werkstoffkunde III	1 SWS	Practice (Ü)	Heilmaier, Kauffmann
Exams					
SS 2018	76-T-MACH-105301	Materials Science III		Prüfung (PR)	Heilmaier, Lang
WS 18/19	76-T-MACH-105301	Materials Science III		Prüfung (PR)	Heilmaier, Lang

Competence Certificate
Oral exam, about 35 minutes

Prerequisites
none

Below you will find excerpts from events related to this course:

V Materials Science and Engineering III
2173553, WS 18/19, 4 SWS, Open in study portal

Lecture (V)

Learning Content
Properties of pure iron; thermodynamic foundations of single-component and of binary systems; nucleation and growth; diffusion processes in crystalline iron; the phase diagram Fe-Fe3C; effects of alloying on Fe-C-alloys; nonequilibrium microstructures; multicomponent iron-based alloys; heat treatment technology; hardenability and hardenability tests.

Workload
regular attendance: 53 hours
self-study: 187 hours

Literature
Lecture Notes; Problem Sheets; Bhadeshia, H.K.D.H. & Honeycombe, R.W.K.
Steels – Microstructure and Properties
CIMA Publishing, 3. Auflage, 2006

T 3.146 Course: Materials Science I & II [T-MACH-105145]

Responsible: Dr.-Ing. Jens Gibmeier
Prof. Dr.-Ing. Martin Heilmaier
Prof. Dr.-Ing. Kay Weidenmann

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102562 - Werkstoffkunde

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	11	Each winter term	2

Events					
SS 2018	2174560	Materials Science and Engineering II for mach, phys	3 SWS	Lecture (V)	Heilmaier, Ulrich
SS 2018	3174015	Materials Science and Engineering II (Lecture)	3 SWS	Lecture (V)	Gibmeier
SS 2018	3174026	Materials Science and Engineering II (Tutorials)	1 SWS	Practice (Ü)	Gibmeier, Mitarbeiter
WS 18/19	2173550	Materials Science and Engineering I for mach, phys	4 SWS	Lecture (V)	Seifert, Ulrich, Pundt, Heilmaier
WS 18/19	3173008	Materials Science and Engineering I (Lecture)	4 SWS	Lecture (V)	Gibmeier
WS 18/19	3173009	Materials Science and Engineering I (Tutorial)	1 SWS	Practice (Ü)	Gibmeier
Exams					
SS 2018	76-T-MACH-105145	Materials Science I, II		Prüfung (PR)	Heilmaier
SS 2018	76-T-MACH-105145-2	Materials Science I, II		Prüfung (PR)	Heilmaier
SS 2018	76-T-MACH-105145-English	Materials Science I & II		Prüfung (PR)	Heilmaier
SS 2018	76-T-MACH-105145-W	Materials Science I & II		Prüfung (PR)	Heilmaier
WS 18/19	76-T-MACH-105145	Materials Science I, II		Prüfung (PR)	Heilmaier

Competence Certificate
oral exam, about 25 minutes

Prerequisites
Lab course must be finished successfully prior to the registration for the oral exam.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-105146 - Materials Science Lab Course must have been passed.

Annotation
The workload for the lecture Materials Science I & II is 165 h per semester and consists of the presence during the lectures (WS: 4 SWS, SS: 2SWS) and the exercises (1 SWS per WS and 1 SWS per SS) as well as preparation and rework time at home.

Below you will find excerpts from events related to this course:

V Materials Science and Engineering II for mach, phys

2174560, SS 2018, 3 SWS, Open in study portal

Lecture (V)

Learning Content
Ferrous materials

Non-ferrous metals and alloys

Engineering ceramics

Glasses

Polymers

Composites

Workload
regular attendance: 42 hours
self-study: 108 hours

Literature
Lecture Notes; Problem Sheets;

Shackelford, J.F.
Werkstofftechnologie für Ingenieure
Verlag Pearson Studium, 2005

V Materials Science and Engineering I for mach, phys

2173550, WS 18/19, 4 SWS, Open in study portal

Lecture (V)

Learning Content
Atomic structure and atomic bonds

Structures of crystalline solids

Defects in crystalline solids

Structure of amorphous and semi-crystalline solids

Alloys

Transport and transformation phenomena in the solid state

Microscopy methods

Characterization by means of X-rays, Neutrons and Electrons

Nondestructive testing of materials

Mechanical testing of materials

Workload
regular attendance: 53 hours
self-study: 157 hours

Literature
Lecture Notes; Problem Sheets;

Shackelford, J.F.
Werkstofftechnologie für Ingenieure
Verlag Pearson Studium, 2005

T 3.147 Course: Materials Science Lab Course [T-MACH-105146]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Prof. Dr. Anton Möslang
Prof. Dr.-Ing. Kay Weidenmann

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102562 - Werkstoffkunde

Type	Credits	Recurrence	Version
Studienleistung praktisch	3	Each summer term	1

Events					
SS 2018	2174597	Experimental Lab Course in Material Science	3 SWS	Practical course (P)	Gibmeier, Weidenmann, Lang, Heilmaier, Dietrich
SS 2018	3174016	Materials Science and Engineering Lab Course	3 SWS	Practical course (P)	Gibmeier, Weidenmann, Lang, Heilmaier, Dietrich
Exams					
SS 2018	76-T-MACH-105146	Materials Science, Lab Course		Prüfung (PR)	Heilmaier
WS 18/19	76-T-MACH-105146	Materials Science and Engineering, Lab Course		Prüfung (PR)	Heilmaier

Competence Certificate
Oral colloquium at the beginning of each topic; certificate of successful attendance.

Prerequisites
none

Annotation
The workload for the lab course Materials Science is 90 h in total and consists of the presence during the 10 experiments (one week half-time, 4 hours per day) as well as preparation and rework time at home.

Below you will find excerpts from events related to this course:

V Experimental Lab Course in Material Science

2174597, SS 2018, 3 SWS, Open in study portal

Practical course (P)

Learning Content
Performing and evaluating of two laboratory experiments in each of the following topics:

Mechanical testing of materials
Nonmetallic materials
Microstructure and properties
Cyclic loading / fatigue
Influence of manufacturing technique on materials

Workload
regular attendance: 22 hours
self-study: 68 hours

Literature
Laboratory script;

Shackelford, J.F.
Werkstofftechnologie für Ingenieure
Verlag Pearson Studium, 2005

T 3.148 Course: Mathematical Methods in Dynamics [T-MACH-105293]

Responsible: Prof. Dr.-Ing. Carsten Proppe
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102582 - Schwerpunkt: Kontinuumsmechanik
M-MACH-102746 - Wahlpflichtmodul
M-MACH-104430 - Schwerpunkt: Modellbildung und Simulation in der Dynamik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	5	Each winter term	1

Events					
WS 18/19	2161206	Mathematical Methods in Dynamics	2 SWS	Lecture (V)	Proppe
WS 18/19	2161207	Übungen zu Mathematische Methoden der Dynamik	1 SWS	Practice (Ü)	Koebele, Proppe
Exams					
SS 2018	76-T-MACH-105293	Mathematical Methods in Dynamics		Prüfung (PR)	Proppe
WS 18/19	76-T-MACH-105293	Mathematical Methods in Dynamics		Prüfung (PR)	Proppe

Competence Certificate
written examination, 180 min.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Mathematical Methods in Dynamics

2161206, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Dynamics of continua:
Concept of continuum, geometry of continua, kinematics and kinetics of continua

Dynamics of rigid bodies:
Kinematics and kinetics of rigid bodies

Variational principles:
Priniciple of virtual work, variational calculations, Principle of Hamilto

Approximate solution methods:
Methods of weighted residuals, method of Ritz

Applications

Workload
Lectures and exercices: 32 h

Studies: 118 h

Literature
Lecture notes (available online)

J.E. Marsden, T.J.R. Hughes: Mathematical foundations of elasticity, New York, Dover, 1994

P. Haupt: Continuum mechanics and theory of materials, Berlin, Heidelberg, 2000

M. Riemer: Technische Kontinuumsmechanik, Mannheim, 1993

K. Willner: Kontinuums- und Kontaktmechanik : synthetische und analytische Darstellung, Berlin, Heidelberg, 2003

J.N. Reddy: Energy Principles and Variational Methods in applied mechanics, New York, 2002

A. Boresi, K.P. Chong, S. Saigal: Approximate solution methods in engineering mechanics, New York, 2003

V **Übungen zu Mathematische Methoden der Dynamik** **Practice (Ü)**
2161207, WS 18/19, 1 SWS, Open in study portal

Learning Content
Excercises related to the lecture

T 3.149 Course: Mathematical Methods in Fluid Mechanics [T-MACH-105295]

Responsible: Prof. Dr.-Ing. Bettina Frohnapfel
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	6	Each summer term	1

Events					
SS 2018	2154432	Mathematical Methods in Fluid Mechanics	2 SWS	Lecture (V)	Frohnapfel, Gatti
SS 2018	2154433	Tutorial in Mathematical Methods of Fluid Mechanics	1 SWS	Practice (Ü)	Frohnapfel, Gatti
Exams					
SS 2018	76-T-MACH-105295	Mathematical Methods in Fluid Mechanics		Prüfung (PR)	Frohnapfel, Gatti
WS 18/19	7600001	Mathematical Methods in Fluid Mechanics		Prüfung (PR)	Frohnapfel, Gatti
WS 18/19	76-T-MACH-105295	Mathematical Methods in Fluid Mechanics		Prüfung (PR)	

Competence Certificate
written examination - 3 hours

Prerequisites
none

Recommendation
Basic Knowledge about Fluid Mechanics

Below you will find excerpts from events related to this course:

V Mathematical Methods in Fluid Mechanics — Lecture (V)
2154432, SS 2018, 2 SWS, Open in study portal

Description
Media:

chalk board, Power Point

Learning Content
The lecture will cover a selection of the following topics:

- Potential flow theory
- Creeping flows
- Lubrication theory
- Boundary-layer theory
- Laminar-turbulent transition (linear stability theory)
- Turbulent flows
- Numerical solution of the governing equation (finite difference methods)

Workload
regular attendance: 30 hours
self-study: 150 hours

Literature
Kundu, P.K., Cohen, K.M.: Fluid Mechanics, Elsevier, 4th Edition, 2008

Batchelor, G.K.: An Introduction to Fluid Dynamics, Cambridge Mathematical Library, 2000

Pope, S. B.: Turbulent Flows, Cambridge University Press, 2000

Ferziger, H., Peric, M.: Computational Methods for Fluid Dynamics, Springer, 2008

V

Tutorial in Mathematical Methods of Fluid Mechanics

2154433, SS 2018, 1 SWS, Open in study portal

Practice (Ü)

Description
Media:

chalk board, Power Point

Learning Content
The exercises will practise the lecture topics:

- Curvilinear coordinates and tensor calculus
- Potential flow theory
- Boundary-layer theory
- Laminar-turbulent transition (linear stability theory)
- Turbulent flows
- Numerical solution of the governing equation (finite difference methods)

Workload
regular attendance: 10,5 hours
self-study: 49,5 hours

Literature
Kundu, P.K., Cohen, K.M.: Fluid Mechanics, Elsevier, 4th Edition, 2008

Batchelor, G.K.: An Introduction to Fluid Dynamics, Cambridge

Mathematical Library, 2000

Boiko, A. V., Grek, G. R., Dovgal, A. V., Kozlov, V. V.: The Origin of Turbulence in Near-Wall Flows, Springer, 2002

Pope, S. B.: Turbulent Flows, Cambridge University Press, 2000

Ferziger, H., Peric, M.: Computational Methods for Fluid Dynamics, Springer, 2008

T 3.150 Course: Mathematical Methods in Strength of Materials [T-MACH-100297]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102582 - Schwerpunkt: Kontinuumsmechanik
M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	5	Each winter term	4

Events					
WS 18/19	2161254	Mathematical Methods in Strength of Materials	2 SWS	Lecture (V)	Böhlke
Exams					
SS 2018	76-T-MACH-100297	Mathematical Methods in Strength of Materials		Prüfung (PR)	Böhlke, Langhoff
WS 18/19	76-T-MACH-100297	Mathematical Methods in Strength of Materials		Prüfung (PR)	Böhlke

Competence Certificate
written exam (90 min). Additives as announced.

Prerequisites
Passing the Tutorial to Mathematical Methods of Strength of Materials

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-106830 - Tutorial Mathematical Methods in Strength of Materials must have been passed.

Below you will find excerpts from events related to this course:

V Mathematical Methods in Strength of Materials

2161254, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Tensor algebra

- vectors; basis transformation; dyadic product; tensors of 2nd order
- properties of 2nd order tensors: symmetry, anti-symmetry, orthogonality etc.
- eigenvalue problem, theorem of Cayley-Hamilton, invariants; tensors of higher order
- tensor algebra in curvilinear coordinate systems
- tensor analysis in curvilinear coordinate systems
- Differentiation of tensor functions

Application of tensor calculus in strength of materials

- kinematics of infinitesimal and finite deformations
- transport theorem, balance equations, stress tensor
- theory of elasticity
- thermo-elasticity

Workload
regular attendance: 31,5 hours
self-study: 118,5 hours

Literature
lecture notes
Bertram, A.: Elasticity and Plasticity of Large Deformations - an Introduction. Springer 2005.
Liu, I-S.: Continuum Mechanics. Springer, 2002.
Schade, H.: Tensoranalysis.Walter de Gruyter, New York, 1997.
Wriggers, P.: Nichtlineare Finite-Element-Methoden. Springer, 2001.

T 3.151 Course: Mathematical Methods of Vibration Theory [T-MACH-105294]

Responsible: Prof. Dr.-Ing. Wolfgang Seemann
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul
M-MACH-104430 - Schwerpunkt: Modellbildung und Simulation in der Dynamik
M-MACH-104442 - Schwerpunkt: Schwingungslehre

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	5	Each summer term	1

Events					
SS 2018	2162241	Mathematical methods of vibration theory	2 SWS	Lecture (V)	Seemann
SS 2018	2162242	Mathematical methods of vibration theory (Tutorial)	2 SWS	Practice (Ü)	Seemann, Becker
Exams					
SS 2018	76-T-MACH-105294	Mathematical Methods of Vibration Theory		Prüfung (PR)	Seemann
WS 18/19	76-T-MACH-105294	Mathematical Methods of Vibration Theory		Prüfung (PR)	Seemann

Competence Certificate
written examination, 180 min.

Prerequisites
none

Recommendation
Engineering Mechanics III/IV

Below you will find excerpts from events related to this course:

V Mathematical methods of vibration theory

2162241, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Linear, time-invariant, ordinary single differential equations: homogeneous solution; harmonic, periodic and non-periodic excitations; Duhamel's integral; Fourier and Laplace transform; introduction into the theory of distributions; Systems of ordinary differential equations: matrix notation, eigenvalue theory, fundamental matrix, forced vibrations via modal expansion and transition matrix; Introduction into the dynamic stability theory; Partial differential equations: solution in product form, eigenvalue theory, modal expansion using Ritz series; Variational methods, Hamilton's principle, boundary value problems representing vibrating continua; Perturbation methods

Workload
time of attendance: 24h; self-study: 65h

Literature
Riemer, Wedig, Wauer: Mathematische Methoden der Technischen Mechanik

V Mathematical methods of vibration theory (Tutorial)

2162242, SS 2018, 2 SWS, Open in study portal

Practice (Ü)

Learning Content
Seven tutorials with examples of the contents of the course

Workload
time of attendance: 10,5h; self-study: 20h

Literature

Riemer, Wedig, Wauer: Mathematische Methoden der Technischen Mechanik

T 3.152 Course: Mathématiques appliquées aux sciences de l'ingénieur [T-MACH-105452]

Responsible: Prof. Dr. Jean-Yves Dantan
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	5	Each term	1

Events					
SS 2018	2161230	Mathématiques appliquées aux sciences de l'ingénieur	4 SWS	Lecture / Practice (VÜ)	Dantan
WS 18/19	2161230	Mathématiques appliquées aux sciences de l'ingénieur	4 SWS	Lecture / Practice (VÜ)	Dantan
Exams					
SS 2018	76-T-MACH-105452	Mathématiques appliquées aux sciences de l'ingénieur		Prüfung (PR)	Böhlke
WS 18/19	76-T-MACH-105452	Mathématiques appliquées aux sciences de l'ingénieur		Prüfung (PR)	Böhlke

Competence Certificate
oral exam, 30 min.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Mathématiques appliquées aux sciences de l'ingénieur

2161230, SS 2018, 4 SWS, Open in study portal

Lecture / Practice (VÜ)

Learning Content
Courses are taught in French.

First block course at the KIT:
Basics of probability theory and Laplace transformation

Second block course at the Arts et Métiers ParisTech, centre Metz, France
Application of mathematics in the fields of functional safety of structural components, reliability of components and systems, vibrations and control systems.
A visit to an industry partner in the vicinity of Metz will be planned.

Annotation
The second block course will probably take place 1-2 days in Metz. KIT-DeFI will be responsible for the organisation and bear the expenses for the students interested.

Further information: www.itm.kit.edu/dynamik und www.defi.kit.edu.

Workload
General attendance: 21 h

Self-study: 129 h

V Mathématiques appliquées aux sciences de l'ingénieur

2161230, WS 18/19, 4 SWS, Open in study portal

Lecture / Practice (VÜ)

Learning Content
Courses are taught in French.

First block course at the KIT:
Basics of probability theory and Laplace transformation

Second block course at the Arts et Métiers ParisTech, centre Metz, France
Application of mathematics in the fields of functional safety of structural components, reliability of components and systems, vibrations and control systems.
A visit to an industry partner in the vicinity of Metz will be planned.

Annotation
The second block course will probably take place 1-2 days in Metz. KIT-DeFI will be responsible for the organisation and bear the expenses for the students interested.

Further information: www.itm.kit.edu/dynamik und www.defi.kit.edu.

Workload
General attendance: 21 h

Self-study: 129 h

T 3.153 Course: Measurement II [T-MACH-105335]

Responsible: Prof. Dr.-Ing. Christoph Stiller
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102817 - Schwerpunkt: Informationstechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	1

Events					
SS 2018	2138326	Measurement II	2 SWS	Lecture (V)	Stiller, Wirth
Exams					
SS 2018	76-T-MACH-105335	Measurement II		Prüfung (PR)	Stiller
WS 18/19	76-T-MACH-105335	Measurement II		Prüfung (PR)	Stiller

Competence Certificate
written exam

60 min.

2 DIN A4 Self-created formular sheets allowed

Prerequisites
none

Below you will find excerpts from events related to this course:

V Measurement II
2138326, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. Amplifiers
2. Digital technology
3. Stochastic modeling for measurement applications
4. Estimation
5. Kalman Filter
6. Environmental perception

Workload
120 hours

Literature
Various Scripts

T 3.154 Course: Mechanical Design I & II [T-MACH-105286]

Responsible: Prof. Dr.-Ing. Albert Albers
Norbert Burkardt
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102573 - Maschinenkonstruktionslehre

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	7	Each winter term	1

Events					
SS 2018	2146178	Mechanical Design II	2 SWS	Lecture (V)	Albers, Behrendt
SS 2018	3146017	Mechanical Design II Lecture	2 SWS	Lecture (V)	Albers, Burkardt
WS 18/19	2145178	Mechanical Design I	2 SWS	Lecture (V)	Albers, Behrendt, Matthiesen
WS 18/19	3145186	Mechanical Design I (Lecture)	2 SWS	Lecture (V)	Albers, Burkardt
Exams					
SS 2018	76-T-MACH-105286	Mechanical Design I & II		Prüfung (PR)	Albers, Burkardt
WS 18/19	76T-MACH-105286	Mechanical Design I & II		Prüfung (PR)	Albers, Burkardt

Competence Certificate
written exam, graded, duration: 60 min

Prerequisites
Admission to the exam only with successful completion of the T-MACH-105282 - Mechanical Design I, prerequisites and T-MACH-105283 - Mechanical Design II, prerequisites.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-105282 - Mechanical Design I, prerequisites must have been passed.
2. The course T-MACH-105283 - Mechanical Design II, prerequisites must have been passed.

Below you will find excerpts from events related to this course:

V Mechanical Design II

2146178, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Beamer

Visualizer

Mechanical components

Learning Content
Bearings

Sealings

Design

Tolerances and fittings

Shaft-hub connections

Tutorials take place in concomitant to the lectures.

Annotation
Lecture notes:

The Productdevelopment knowledge base PKB will be provided in digital form for registered students. All lecture notes and additional slides will be provided in Ilias.

Workload
regular attendance: 42 h

self-study: 80 h

Literature
Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X ,

also available as electronic paper at the KIT catalogue.

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8)

V Mechanical Design I

2145178, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Beamer

Visualizer

Mechanical components

Learning Content
Introduction in product development

Tools for visualization (technical drawing)

Product generation as a problem solving process

Technical systems for Product generation

- systems theory
- Contact and Channel Approach C&C²-A

Basics of selected technical components

- springs
- bearings

Concommitant to the lectures tutorials take place with the following contents:

Gear workshop

Tutorial "tools of visualization (technical drawing)"

Tutorial "technical systems product development, sytem theory, Contact and Channel Approach - C&C²-A"

Tutorial "springs"

Tutorial "bearing and bearing arrangements"

Annotation
Lecture notes:

The Productdevelopment knowledge base PKB will be provided in digital form for registered students. All lecture notes and additional slides will be provided in ILIAS.

Workload
regular attendance: 42 h

self-study: 80 h

Literature
Lecture notes:

The lecture notes can be downloaded via the eLearning platform Ilias.

Literature:

Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

or per full text access provided by university library

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

V **Mechanical Design I (Lecture)** **Lecture (V)**
3145186, WS 18/19, 2 SWS, Open in study portal

Description
Media:

Beamer

Visualizer

Mechanical components

Learning Content
Introduction in product development

Tools for visualization (technical drawing)

Product generation as a problem solving process

Technical systems for Product generation

- systems theory
- Contact and Channel Approach C&C²-A

Basics of selected technical components

- springs
- bearings

Concommitant to the lectures tutorials take place with the following contents:

Gear workshop

Tutorial "tools of visualization (technical drawing)"

Tutorial "technical systems product development, sytem theory, Contact and Channel Approach - C&C²-A"

Tutorial "springs"

Tutorial "bearing and bearing arrangements"

Annotation
Lecture notes:

The Productdevelopment knowledge base PKB will be provided in digital form for registered students. All lecture notes and additional slides will be provided in ILIAS.

Workload
regular attendance: 42 h

self-study: 80 h

Literature
Lecture notes:

The lecture notes can be downloaded via the eLearning platform Ilias.

Literature:

Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

or per full text access provided by university library

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

T 3.155 Course: Mechanical Design I, prerequisites [T-MACH-105282]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102573 - Maschinenkonstruktionslehre

Type	Credits	Recurrence	Version
Studienleistung	0	Each winter term	1

Events					
WS 18/19	2145185	Tutorials Mechanical Design I	1 SWS	Practice (Ü)	Albers, Matthiesen, Mitarbeiter
WS 18/19	3145187	Mechanical Design I (Tutorial)	2 SWS	Practice (Ü)	Albers, Burkardt
Exams					
SS 2018	76-T-MACH-105282	Mechanical Design I		Prüfung (PR)	Albers, Burkardt
WS 18/19	76-T-MACH-105282	Mechanical Design I		Prüfung (PR)	Albers, Matthiesen

Competence Certificate
Concomitant to the lecture, a workshop with 3 workshop sessions takes place over the semester. During the workshop the students are divided into groups and their mechanical design knowledge will be tested during a colloquium at the beginning of every single workshop session. The attendance is mandatory and will be controlled. The pass of the colloquia and the process of the workshop task are required for the successful participation.

Furthermore an online test is carried out.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Tutorials Mechanical Design I
2145185, WS 18/19, 1 SWS, Open in study portal

Practice (Ü)

Description
Media:

Beamer

Visualizer

Gear box (Workshop)

Learning Content
Gear workshop

Tutorial "tools of visualization (technical drawing)"

Tutorial "technical systems product development, sytem theory, Contact and Channel Approach - C&C²-A"

Tutorial "springs"

Tutorial "bearing and bearing arrangements"

Workload
lectures: 10.5 h

preparation to exam: 49.5 h

Literature
Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

V Mechanical Design I (Tutorial)

3145187, WS 18/19, 2 SWS, Open in study portal

Practice (Ü)

Description
Media:

Beamer

Visualizer

Gear box (Workshop)

Learning Content
Gear workshop

Tutorial "tools of visualization (technical drawing)"

Tutorial "technical systems product development, sytem theory, Contact and Channel Approach - C&C²-A"

Tutorial "springs"

Tutorial "bearing and bearing arrangements"

Workload
lectures: 10.5 h

preparation to exam: 49.5 h

Literature
Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

T 3.156 Course: Mechanical Design II, prerequisites [T-MACH-105283]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102573 - Maschinenkonstruktionslehre

Type	Credits	Recurrence	Version
Studienleistung	0	Each summer term	1

Events					
SS 2018	2146185	Tutorials Mechanical Design II	2 SWS	Practice (Ü)	Albers, Behrendt, Mitarbeiter
SS 2018	3146018	Mechanical Design II Tutorials	2 SWS	Practice (Ü)	Albers, Mitarbeiter
Exams					
SS 2018	76-T-MACH-105283	Mechanical Design II		Prüfung (PR)	Albers, Burkardt
WS 18/19	76-T-MACH-105283	Mechanical Design II		Prüfung (PR)	Albers, Burkardt

Competence Certificate
Concomitant to the lecture, 2 online tests are carried out and the knowledge from the lecture will be tested. The knowledge from mechanical design I and II will further be controlled with a design and a CAD task.

Prerequisites
None

Below you will find excerpts from events related to this course:

V Tutorials Mechanical Design II

2146185, SS 2018, 2 SWS, Open in study portal

Practice (Ü)

Description
Media:

Beamer

Visualizer

model box (Workshop)

Learning Content
Bearings

Sealings

Design

Tolerances and fittings

Shaft-hub connections

Workload
lectures: 21 h

preparation to exam: 39 h

Literature
Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

T 3.157 Course: Mechanical Design III & IV [T-MACH-104810]

Responsible: Prof. Dr.-Ing. Albert Albers
Norbert Burkardt
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102573 - Maschinenkonstruktionslehre

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	13	Each winter term	2

Events					
SS 2018	2146177	Mechanical Design IV	2 SWS	Lecture (V)	Matthiesen
SS 2018	3146020	Mechanical Design IV Lecture	2 SWS	Lecture (V)	Albers, Burkardt
WS 18/19	2145151	Mechanical Design III	2 SWS	Lecture (V)	Albers, Matthiesen, Mitarbeiter
WS 18/19	3145016	Mechanical Design III (Lecture)	2 SWS	Lecture (V)	Albers, Burkardt
Exams					
SS 2018	76-T-MACH-104810	Mechanical Design III & IV		Prüfung (PR)	Albers, Burkardt
WS 18/19	76-T-MACH-104810	Mechanical Design III & IV		Prüfung (PR)	Albers, Burkardt

Competence Certificate
written exam consisting of:

- written part duration 60 min and
- design part duration 180 min

Sum: 240 min

Prerequisites
Admission to the exam only with successful completion of the T-MACH-105284 - Mechanical Design III, Constructing the Team and T-MACH-105285 - Mechanical Design IV, Constructing the Team.

Modeled Conditions
You have to fulfill one of 2 conditions:

1. The course T-MACH-105284 - Mechanical Design III, Constructing the Team must have been passed.
2. The course T-MACH-105285 - Mechanical Design IV, Constructing the Team must have been passed.

Below you will find excerpts from events related to this course:

V Mechanical Design IV

2146177, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Beamer

Visualizer

Mechanical components

Learning Content
Basic connections - part 2

Coupling fundamentals

Function and working principles
Significant characteristics and classification
Non-shiftable shaft couplings
Shiftable shaft couplings
Elastic couplings

Gear transmission fundamentals

Function and working principles
Fundamentals of gear transmissions
Significant characteristics and classification
Selection criteria
Fundamentals of further gear drives
Fundamentals of lubrication and lubricants

Tooth system fundamentals

Function and working principles
Tooth pitch characters
Cycloid as slope curve
Evolvent as slope curve
Manufacturing technologies
Transverse contact ratio
Profile offset
Application limits and technical defects
Dimensioning
Root bearing
Flank bearing

Hydraulic fundamentals

Basic functions and working principles
Significant characteristics and classification
Model types and characteristics
Selection criteria
Application
Dimensioning

Annotation
Lecture notes:

The product development knowledge base PKB will be provided in digital form for registered students. All lecture notes and additional slides will be provided in Ilias.

Workload
regular attendance: 42 h

self-study: 80 h

Literature
Lecture notes:

The lecture notes can be downloaded via the eLearning platform Ilias.

Literature:

Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

or per full text access provided by university library

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3(für Fortgeschrittene)

V **Mechanical Design III** **Lecture (V)**
2145151, WS 18/19, 2 SWS, Open in study portal

Description
Media:

Beamer

Visualizer

Mechanical components

Learning Content
component connection

Tolerances and fittings

gears

Annotation
Lecture notes:

The Productdevelopment knowledge base PKB will be provided in digital form for registered students. All lecture notes and additional slides will be provided in Ilias.

Workload
regular attendance: 42 h

self-study: 80 h

Literature
Lecture notes:

The lecture notes can be downloaded via the eLearning platform Ilias.

Literature:

Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

or per full text access provided by university library

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3(für Fortgeschrittene)

V **Mechanical Design III (Lecture)** **Lecture (V)**
3145016, WS 18/19, 2 SWS, Open in study portal

Description
Media:

Beamer

Visualizer

Mechanical components

Learning Content
component connection

Tolerances and fittings

gears

Annotation
Lecture notes:

The Productdevelopment knowledge base PKB will be provided in digital form for registered students. All lecture notes and additional slides will be provided in Ilias.

Workload
regular attendance: 42 h

self-study: 80 h

Literature
Lecture notes:

The lecture notes can be downloaded via the eLearning platform Ilias.

Literature:

Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

or per full text access provided by university library

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3(für Fortgeschrittene)

T 3.158 Course: Mechanical Design III, Constructing the Team [T-MACH-105284]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102573 - Maschinenkonstruktionslehre

Type	Credits	Recurrence	Version
Studienleistung	0	Each winter term	2

Events					
WS 18/19	2145153	Tutorials Mechanical Design III	2 SWS	Practice (Ü)	Albers, Matthiesen, Mitarbeiter
WS 18/19	2145154	Mechanical Design III Workshop	1 SWS	Practice (PÜ)	Albers Assistenten
WS 18/19	3145017	Mechanical Design III (Tutorial)	2 SWS	Practice (Ü)	Albers, Burkardt
WS 18/19	3145018	Mechanical Design III (Workshop)	SWS	Seminar / Practical course (S/P)	Albers, Burkardt
Exams					
SS 2018	76-T-MACH-105284	Mechanical Design III,Constructing the Team		Prüfung (PR)	Albers, Burkardt
WS 18/19	76-T-MACH-105284	Mechanical Design III,Constructing the Team		Prüfung (PR)	Albers, Burkardt

Competence Certificate
Concomitant to the lecture, a workshop with 3 workshop sessions takes place over the semester. During the workshop the students are divided into groups and their mechanical design knowledge will be tested during a colloquium at the beginning of every single workshop session. The attendance is mandatory and will be controlled. The pass of the colloquia and the process of the workshop task are required for the successful participation.

Prerequisites
None

Below you will find excerpts from events related to this course:

V Tutorials Mechanical Design III

2145153, WS 18/19, 2 SWS, Open in study portal

Practice (Ü)

Description
Media:

Beamer

Visualizer

model box (Workshop)

Learning Content
component connection

Tolerances and fittings

gears

Literature
Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

V Mechanical Design III Workshop

2145154, WS 18/19, 1 SWS, Open in study portal

Practice (PÜ)

Learning Content
Interrogation of the purchased knowledge in mechanical design by means of the workshop task.

Annotation
Bonus

The student can achieve an extra bonus for the mechanical design exam.

The bonus amounts to 0,3 exam points and it can only be achieved in case of passed MD-exam (lowest passing grade 4,0).

More details will be announced in mechanical design III and IV.

Workload
regular attendance: 21 h

self-study: 39 h

Literature
Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

V Mechanical Design III (Tutorial)

3145017, WS 18/19, 2 SWS, Open in study portal

Practice (Ü)

Description
Media:

Beamer

Visualizer

model box (Workshop)

Learning Content
component connection

Tolerances and fittings

gears

Literature
Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

V | **Mechanical Design III (Workshop)** | **Seminar / Practical course (S/P)**

3145018, WS 18/19, SWS, Open in study portal

Learning Content
Interrogation of the purchased knowledge in mechanical design by means of the workshop task.

Annotation
Bonus

The student can achieve an extra bonus for the mechanical design exam.

The bonus amounts to 0,3 exam points and it can only be achieved in case of passed MD-exam (lowest passing grade 4,0).

More details will be announced in mechanical design III.

Workload
regular attendance: 21 h

self-study: 39 h

Literature
Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

T 3.159 Course: Mechanical Design IV, Constructing the Team [T-MACH-105285]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102573 - Maschinenkonstruktionslehre

Type	Credits	Recurrence	Version
Studienleistung	0	Each summer term	2

Events					
SS 2018	2146184	Tutorials Mechanical Design IV	2 SWS	Practice (Ü)	Matthiesen, Mitarbeiter
SS 2018	2146187	Workshop 'Mechanical Design IV'	1 SWS	Practice (PÜ)	Matthiesen, Mitarbeiter
SS 2018	3146021	Mechanical Design IV Tutorials	1 SWS	Practice (Ü)	Albers, Mitarbeiter
SS 2018	3146022	Mechanical Design IV Workshop	1 SWS	Practice (PÜ)	Albers, Mitarbeiter
Exams					
SS 2018	76-T-MACH-105285	Mechanical Design IV, Constructing the Team		Prüfung (PR)	Albers, Burkardt
WS 18/19	76-T-MACH-105285	Mechanical Design IV, Constructing the Team		Prüfung (PR)	Albers, Burkardt

Competence Certificate
Concomitant to the lecture, a workshop with 3 workshop sessions takes place over the semester. During the workshop the students are divided into groups and their mechanical design knowledge will be tested during a colloquium at the beginning of every single workshop session. The attendance is mandatory and will be controlled. The pass of the colloquia and the process of the workshop task are required for the successful participation.

Prerequisites
None

Below you will find excerpts from events related to this course:

V Tutorials Mechanical Design IV

2146184, SS 2018, 2 SWS, Open in study portal

Practice (Ü)

Description
Media:

Beamer

Visualizer

Model box (Workshop)

Learning Content
Basic connections - part 2

Coupling fundamentals

Gear transmission fundamentals

Tooth system fundamentals

Hydraulic fundamentals

Workload
lectures: 10.5 h

preparation to exam: 49.5 h

Literature
Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

V Workshop 'Mechanical Design IV'

2146187, SS 2018, 1 SWS, Open in study portal

Practice (PÜ)

Learning Content
Interrogation of the purchased knowledge in mechanical design by means of the workshop task.

Annotation
Bonus

The student can achieve an extra bonus for the mechanical design exam.

The bonus amounts to 0,3 exam points and it can only be achieved in case of passed MD-exam (lowest passing grade 4,0).

More details will announce in mechanical design IV.

Workload
lectures: 10.5 h

preparation to exam: 19.5 h

Literature
Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

T 3.160 Course: Mechanics and Strength of Polymers [T-MACH-105333]

Responsible: Prof. Dr.-Ing. Bernd-Steffen von Bernstorff
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	2

Events					
WS 18/19	2173580	Mechanics and Strengths of Polymers	2 SWS	Lecture (V)	von Bernstorff
Exams					
SS 2018	76-T-MACH-105333	Mechanics and Strengths of Polymers		Prüfung (PR)	von Bernstorff
WS 18/19	76-T-MACH-105333	Mechanics and Strengths of Polymers		Prüfung (PR)	von Bernstorff

Competence Certificate
Oral exam, about 25 minutes

Prerequisites
none

Recommendation
Basic knowledge in materials science (e.g. lecture materials science I and II)

Below you will find excerpts from events related to this course:

V Mechanics and Strengths of Polymers

2173580, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Molecular structure and morphology of polymers, temperature- and time dependency of mechanical behavior, viscoelasticity, time/temperature- superposition principle, yielding, crazing and fracture of polymers, failure criterions, impact and dynamic loading, corresponding principle, tough/brittle-transition, introduction to the principles of fiber reinforcement and multiple cracking in composites

Workload
The workload for the lecture Mechanics and Strengths of Polymers is 120 h per semester and consists of the presence during the lecture (28 h) as well as preparation and rework time at home (92 h).

Literature
A literature list, specific documents and partial lecture notes shall be handed out during the lecture.

T 3.161 Course: Mechanics in Microtechnology [T-MACH-105334]

Responsible: Dr. Christian Greiner
Dr. Patric Gruber

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2181710	Mechanics in Microtechnology	2 SWS	Lecture (V)	Gruber, Greiner, Brandl, Schwaiger
Exams					
SS 2018	76-T-MACH-105334	Mechanics in Microtechnology		Prüfung (PR)	Gruber
WS 18/19	76-T-MACH-105334	Mechanics in Microtechnology		Prüfung (PR)	Gruber

Competence Certificate
Oral examination, ca. 30 min

Prerequisites
none

Below you will find excerpts from events related to this course:

V Mechanics in Microtechnology

2181710, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. Introduction: Application and Processing of Microsystems
2. Scaling Effects
3. Fundamentals: Stress and Strain, (anisotropic) Hooke's Law
4. Fundamentals: Mechanics of Beams and Membranes
5. Thin Film Mechanics: Origin and Role of Mechanical Stresses
6. Characterization of Mechanical Properties of Thin Films and Small Structures: Measurement of Stresses and Mechnical Parameters such as Young'sModulus and YieldDtrength; Thin Film Adhesion and Stiction
7. Transduction: Piezo-resistivity, Piezo-electric Effect, Elektrostatics,...
8. Aktuation: Inverse Piezo-electric Effect, Shape Memory, Elektromagnetic Actuation,…

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature
Folien,
1. M. Ohring: "The Materials Science of Thin Films", Academic Press, 1992
2. L.B. Freund and S. Suresh: "Thin Film Materials"
3. M. Madou: Fundamentals of Microfabrication", CRC Press 1997
4. M. Elwenspoek and R. Wiegerink: "Mechanical Microsensors" Springer Verlag 2000
5. Chang Liu: Foundations of MEMS, Illinois ECE Series, 2006

T 3.162 Course: Metallographic Lab Class [T-MACH-105447]

Responsible: Ulla Hauf
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Studienleistung	4	Each term	2

Events					
SS 2018	2175590	Metallographic Lab Class	3 SWS	Practical course (P)	Hauf
WS 18/19	2175590	Metallographic Lab Class	3 SWS	Practical course (P)	Mühl
Exams					
SS 2018	76-T-MACH-105447	Metallographic Lab Class		Prüfung (PR)	Heilmaier
WS 18/19	76-T-MACH-105447	Metallographic Lab Class		Prüfung (PR)	Heilmaier

Competence Certificate
Colloquium for every experiment, about 60 minutes, protocol

Prerequisites
M-MACH-102562 - Materials Science must be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-MACH-102562 - Materials Science must have been passed.

Below you will find excerpts from events related to this course:

V Metallographic Lab Class

2175590, WS 18/19, 3 SWS, Open in study portal

Practical course (P)

Learning Content
Light microscope in metallography

metallographic sections of metallic materials

Investigation of the microstructure of unalloyed steels and cast iron

Microstructure development of steels with accelerated cooling from the austenite area

Investigation of microstructures of alloyed steels

Investigation of failures quantitative microstructural analysis

Microstructural investigation of technically relevant non-ferrous metals

Application of Scanning electron microscope

Workload
The workload for the Metallographic Lab Class is 120 h per semester and consists of the presence during the lab course (25 h) as well as preparation and rework time at home (95 h).

Literature
E. Macherauch: Praktikum in Werkstoffkunde, 10th edition, 1992

H. Schumann: Metallographie, 13th edition, Deutscher Verlag für Grundstoffindustrie, 1991

Literature List will be handed out with each experiment

T 3.163 Course: Micro- and nanosystem integration for medical, fluidic and optical applications [T-MACH-108809]

Responsible: Dr. Ulrich Gengenbach
Prof. Dr. Veit Hagenmeyer
Dr. Liane Koker
PD Dr.-Ing. Ingo Sieber

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2105032	Micro- and nanosystem integration for medical, fluidic and optical applications	2 SWS	Lecture (V)	Koker, Gengenbach, Sieber
Exams					
WS 18/19	76-T-MACH-108809	Micro- and nanosystem integration for medical, fluidic and optical applications		Prüfung (PR)	Hagenmeyer

Competence Certificate
Oral exam (Duration: 30min)

Prerequisites
T-MACH-105695 "Selected topics of system integration for micro- and nanotechnology" must not be started.

Below you will find excerpts from events related to this course:

V Micro- and nanosystem integration for medical, fluidic and optical applications
2105032, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content

- Introduction to the role of system integration in the product development process
- Simplistic modeling and use of analogies in system design
- Introduction to modeling and simulation in system design
- Mechanics simulation
- Optics simulation
- Fluidics simulation
- Coupling of simulation tools
- Requirements for system integration of active implants
- Design of active implants
- Approaches to system integration of active implants
- Test methods (hermeticity, accelerated aging etc.)
- Micro-optical subsystems
- Micro-fluidic subsystems
- Self-assembly as integration process at micro and nano scale

Workload
regular attendance: 21 hours
self-study: 99 hours

T 3.164 Course: Microenergy Technologies [T-MACH-105557]

Responsible: Prof. Dr. Manfred Kohl
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2142897	Microenergy Technologies	2 SWS	Lecture (V)	Kohl
Exams					
SS 2018	76-T-MACH-105557	Microenergy Technologies		Prüfung (PR)	Kohl
WS 18/19	76-T-MACH-105557	Microenergy Technologies		Prüfung (PR)	Kohl

Competence Certificate
Oral examination (30 Min.)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Microenergy Technologies
2142897, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
- Basic physical principles of energy conversion

- Layout and design optimization
- Technologies
- Selected devices
- Applications

The lecture includes amongst others the following topics:

Micro energy harvesting of vibrations

Thermal micro energy harvesting

Microtechnical applications of energy harvesting

Heat pumps in micro technology

Micro cooling

Workload
time of attendance: 1.5 hours/week

Self-study: 8.5 hours/week

Literature
- Lecture notes (overhead transparencies) "Micro Energy Technologies"
- Stephen Beeby, Neil White, Energy Harvesting for Autonomous Systems, Artech House, 2010
- Shashank Priya, Daniel J. Inman, Energy Harvesting Technologies, Springer, 2009

T 3.165 Course: Modelling and Simulation [T-MACH-100300]

Responsible: Prof. Dr. Peter Gumbsch
Prof. Dr. Britta Nestler
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	5	Each term	2

Events					
SS 2018	2183703	Modelling and Simulation	2+1 SWS	Lecture / Practice (VÜ)	Nestler
WS 18/19	2183703	Numerical methods and simulation techniques	3 SWS	Lecture / Practice (VÜ)	Nestler
Exams					
SS 2018	76-T-MACH-100300	Modelling and Simulation		Prüfung (PR)	Nestler
WS 18/19	76-T-MACH-100300	Modelling and Simulation		Prüfung (PR)	Nestler

Competence Certificate
Written exam, 90 min

Prerequisites
none

Recommendation
preliminary knowlegde in mathematics, physics and materials science

Below you will find excerpts from events related to this course:

V Modelling and Simulation

2183703, SS 2018, 2+1 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

Slides and black board. The slides will be provided as a manuscript for the course.

Learning Content
The course gives an introduction to modelling and simulation techniques.
The following topics are included:
- splines, interpolation methods, Taylor series
- finite difference method
- dynamical systems
- numerics of partial differential equations
- mass and heat diffusion
- microstructure simulation
- parallel and adaptive algorithms
- high performance computing
- practical exercises

Workload
regular attendance: 22,5 hours lecture, 11,5 hours exercises
self-study: 116 hours

Literature

1. Scientific Computing, G. Golub and J.M. Ortega (B.G.Teubner Stuttgart 1996)

V **Numerical methods and simulation techniques** **Lecture / Practice (VÜ)**

2183703, WS 18/19, 3 SWS, Open in study portal

Description
Media:

Slides and black board. The slides will be provided as a manuscript for the course.

Learning Content
The course gives an introduction to modelling and simulation techniques.

The following topics are included:

- polynom interpolation methods, splines, Taylor series
- zero point algorithms
- regression methods
- numerical differentiation and integration
- finite difference method
- dynamical systems, ordinary partial differential equations
- numerics of partial differential equations
- mass and heat diffusion equation
- computer lab in the programming language C, practical exercises

In parallel to the lecture, regular exercise sheets are provided and discussed. In addition, the course will be accompanied by practical exercises at the computer. Precondition to register for the written exam is the successful participation in the accompanying computer lab by presenting the solved excercise sheets at the PC.

Workload
regular attendance: 22,5 hours lecture, 11,5 hours exercises
self-study: 116 hours

Literature

1. Scientific Computing, G. Golub and J.M. Ortega (B.G.Teubner Stuttgart 1996)

T 3.166 Course: Modelling of Microstructures [T-MACH-105303]

Responsible: Dr. Anastasia August
Prof. Dr. Britta Nestler

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul
M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	5	Each winter term	2

Events					
WS 18/19	2183702	Modelling of Microstructures	3 SWS	Lecture / Practice (VÜ)	August, Nestler
Exams					
SS 2018	76-T-MACH-105303	Modelling of Microstructures		Prüfung (PR)	August, Nestler, Weygand
WS 18/19	76-T-MACH-105303	Modelling of Microstructures		Prüfung (PR)	August, Nestler, Weygand

Competence Certificate
oral exam 30 min

Prerequisites
none

Recommendation
materials science
fundamental mathematics

Below you will find excerpts from events related to this course:

V Modelling of Microstructures

2183702, WS 18/19, 3 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

Black board and slides.

Learning Content

- Brief Introduction in thermodynamics
- Statistical interpretation of entropy
- Gibbs free energy and phase diagrams
- Free energy functional
- Phasefield equation
- Gibbs-Thomson-equation
- Driving forces
- Grand chemical potential functional and the evolution equations
- For compare: Free energy functional with driving forces

Workload
regular attendance: 22,5 hours lecture, 11,5 hours exercises
self-study: 116 hours

Literature

1. Gottstein, G. (2007) Physikalische Grundlagen der Materialkunde. Springer Verlag Berlin Heidelberg
2. Kurz, W. and Fischer, D. (1998) Fundamentals of Solidification. Trans Tech Publications ltd, Switzerland Germany UK USA
3. Porter, D.A. Eastering, K.E. and Sherif, M.Y. (2009) Phase transformation in metals and alloys (third edition). CRC Press, Taylor & Francis Group, Boca Raton, London, New York
4. Gaskell, D.R., Introduction to the thermodynamics of materials
5. Problem sheets

T 3.167 Course: Modern Control Concepts I [T-MACH-105539]

Responsible: Dr. Lutz Groell
PD Dr.-Ing. Jörg Matthes

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	1

Events					
SS 2018	2105024	Modern Control Concepts I	2 SWS	Lecture (V)	Matthes, Groell
Exams					
SS 2018	76-T-MACH-105539	Modern Control Concepts I		Prüfung (PR)	Hagenmeyer
WS 18/19	76-T-MACH-105539	Modern Control Concepts I		Prüfung (PR)	Hagenmeyer

Competence Certificate
Written exam (Duration: 1 h)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Modern Control Concepts I

2105024, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content

1. Introduction (classification, overviews, model simplification)
2. Simulation and analysis of dynamical systems with Matlab
3. Linearisation (equilibrium manifold, low-delta-method, Hartman-Grobman-theorem, design methodology for linear setpoint controller)
4. Two-degree-of-freedom control (structure, reference signal design)
5. PID-Controller (practical realisation, design hints, anti-windup-methods, Smith-predictor, switching technics, complex example)
6. Multi variable control and advanced control structures
7. State space (geometric view, role of zeros)
8. Tracking control with state feedback and supplemental integrator
9. Observer (LQG-design, disturbance observer, reduced observer)
10. Limits of control (existence subject, limits in time and frequency domain)

Workload
General attendance: 21 h

Self-study: 99 h

Literature

- Aström, K.-J., Murray, R.M.: Feedback Systems, 2012
- Rugh, W.: Linear System Theory. Prentice Hall, 1996

T 3.168 Course: Novel Actuators and Sensors [T-MACH-102152]

Responsible: Prof. Dr. Manfred Kohl
Dr. Martin Sommer

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	2

Events					
WS 18/19	2141865	Novel actuators and sensors	2 SWS	Lecture (V)	Kohl, Sommer
Exams					
SS 2018	76-T-MACH-102152	Novel Actuators and Sensors		Prüfung (PR)	Sommer, Kohl
WS 18/19	76-T-MACH-102152	Novel Actuators and Sensors		Prüfung (PR)	Kohl, Sommer

Competence Certificate
oral exam (30 Min.)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Novel actuators and sensors

2141865, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Script / script of ppt foils (part 2)

Learning Content
Contents: - Basic knowledge in the material science of actuator and sensor principles

- Layout and design optimization

- Fabrication technologies

- Selected developments

- Applications

Index: The lecture includes amongst others the following topics:

- Piezo actuators
- Magnetostrictive actuators
- Shape memory actuators
- Electro-/magnetorheological actuators
- Sensors: Concepts, materials, fabrication
- Micromechanical sensors: Pressure, force, inertia sensors
- Temperature sensors
- Micro sensors for bio analytics
- Mechano-magnetic sensors

The lecture addresses students in the fields of mechanical engineering, mechatronics and information technology, materials science and engineering, electrical engineering and economic sciences. A comprehensive introduction is given in the basics and current developments on the macroscopic length scale.

The lecture is core subject of the major course "Actuators and Sensors" of the specialization "Mechatronics and Microsystems Technology" in Mechanical Engineering.

Workload
Work Lecture:

time of attendance: 21 hours

Self-study: 99 hours

Literature
- Lecture notes
- Donald J. Leo, Engineering Analysis of Smart Material Systems, John Wiley & Sons, Inc., 2007
- "Sensors Update", Edited by H.Baltes, W. Göpel, J. Hesse, VCH, 1996, ISBN: 3-527-29432-5
- "Multivariate Datenanalyse – Methodik und Anwendungen in der Chemie", R. Henrion, G. Henrion, Springer 1994, ISBN 3-540-58188-X

T 3.169 Course: Numerical Fluid Mechanics [T-MACH-105338]

Responsible: Dr.-Ing. Franco Magagnato
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik
M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2153441	Numerical Fluid Mechanics	2 SWS	Lecture (V)	Magagnato
Exams					
SS 2018	76-T-MACH-105338	Numerical Fluid Mechanics		Prüfung (PR)	Gabi
WS 18/19	7600004	Numerical Fluid Mechanics		Prüfung (PR)	Frohnapfel, Magagnato
WS 18/19	76-T-MACH-105338	Computational Methods in Fluid Mechanics		Prüfung (PR)	Magagnato

Competence Certificate
oral exam - 30 minutes

Prerequisites
none

Below you will find excerpts from events related to this course:

V Numerical Fluid Mechanics
2153441, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Description
Media:
"Powerpoint presentation", Beamer

Learning Content
1. Governing Equations of Fluid Dynamics
2. Discretization
3. Boundary and Initial conditions
4. Turbulence Modelling
5. Mesh Generation
6. Numerical Methods
7. LES, DNS and Lattice Gas Methods
8. Pre- and Postprocessing
9. Examples of Numerical Methods for Industrial Applications

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature
Ferziger, Peric: Computational Methods for Fluid Dynamics. Springer-Verlag, 1999.
Hirsch: Numerical Computation of Internal and External Flows. John Wiley & Sons Inc., 1997.
Versteg, Malalasekera: An introduction to computational fluid dynamics. The finite volume method. John Wiley & Sons Inc., 1995

T 3.170 Course: Numerical Methods for combustion process development [T-MACH-105716]

Responsible: Dr.-Ing. Heiko Kubach
Dr.-Ing. Ulf Waldenmaier

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102645 - Schwerpunkt: Technik des Verbrennungsmotors

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	2	Each winter term	1

Events					
WS 18/19	2133130	Numerical Methods for combustion process development	1 SWS	Block lecture (BV)	Waldenmaier
Exams					
SS 2018	76-T-MACH-105716	Numerical Methods for combustion process development		Prüfung (PR)	Koch
WS 18/19	76-T-MACH-105716	Numerical Methods for combustion process development		Prüfung (PR)	Koch

Competence Certificate
oral exam, 15 min

Prerequisites
none

Below you will find excerpts from events related to this course:

V Numerical Methods for combustion process development

2133130, WS 18/19, 1 SWS, Open in study portal

Block lecture (BV)

Learning Content
Introduction

Working process calculation

Pressure trace analysis

Overall system

Combustion simulation

further CFD applications

Validation methods

Workload
regular attendance: 14 hours
self-study: 46 hours

T 3.171 Course: Photovoltaics [T-ETIT-101939]

Responsible: Prof. Dr.-Ing. Michael Powalla
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	6	Each summer term	2

Events					
SS 2018	2313737	Photovoltaics	4 SWS	Lecture (V)	Powalla, Lemmer
Exams					
SS 2018	7313737	Photovoltaics		Prüfung (PR)	Powalla, Lemmer
WS 18/19	7313737	Photovoltaics		Prüfung (PR)	Powalla, Lemmer

Prerequisites
"M-ETIT-100524 - Solar Energy" must not have started.

T 3.172 Course: Physical and Chemical Principles of Nuclear Energy in View of Reactor Accidents and Back-End of Nuclear Fuel Cycle [T-MACH-105537]

Responsible: Dr. Ron Dagan
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	2	Each winter term	2

Events					
WS 18/19	2189906	Physical and chemical principles of nuclear energy in view of reactor accidents and back-end of nuclear fuel cycle	1 SWS	Lecture (V)	Dagan
Exams					
SS 2018	76-T-MACH-105537	Physical and Chemical Principles of Nuclear Energy in View of Reactor Accidents and Back-End of Nuclear Fuel Cycle		Prüfung (PR)	Stieglitz, Dagan
WS 18/19	76-T-MACH-105537	Physical and Chemical Principles of Nuclear Energy in View of Reactor Accidents and Back-End of Nuclear Fuel Cycle		Prüfung (PR)	Dagan, Stieglitz

Competence Certificate
oral exam, 30 min.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Physical and chemical principles of nuclear energy in view of reactor accidents and back-end of nuclear fuel cycle

Lecture (V)

2189906, WS 18/19, 1 SWS, Open in study portal

Learning Content

- Relevant physical terms of nuclear physics
- Decay heat removal- Borst-Wheeler equation
- The accidents in TMI- Three Mile Island, and Fukushima .
- Fission , chain reaction and reactor control systems
- Basics of nuclear cross sections
- Principles of reactor dynamics
- Reactor poisoning
- The Idaho and Chernobyl accidents
- Principles of the nuclear fuel cycle
- Reprocessing of irradiated fuel elements and vitrification of fission product solutions
- Interim storage of nuclear residues in surface facilities
- Multi barrier concepts for final disposal in deep geological formations
- The situation in the repositories Asse II, Konrad and Morsleben

Workload

Regular attendance: 14 h

self study 46 h

Literature

AEA- Open documentation of the reactor accidents

K. Wirtz: Basics of Reactor technic Par I, II, Technic School Karlsruhe 1966 (in German)

D. Emendorfer. K.H. Höcker: Theory of nuclear reactions, Parts I, II BI- Hochschultaschenbücher 1969 (in German)

J. Duderstadt and L. Hamilton: Nuclear reactor Analysis, J. Wiley $ Sons , Inc. 1975.

R.C. Ewing: The nuclear fuel cycle: a role for mineralogy and geochemistry. Elements vol. 2, p.331-339, 2006

J. Bruno, R.C. Ewing: Spent nuclear fuel. Elements vol. 2, p.343-349, 2006

T 3.173 Course: Physical Basics of Laser Technology [T-MACH-102102]

Responsible: Dr.-Ing. Johannes Schneider
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	5	Each winter term	3

Events					
WS 18/19	2181612	Physical basics of laser technology	3 SWS	Lecture / Practice (VÜ)	Schneider
Exams					
SS 2018	76-T-MACH-102102	Physical Basics of Laser Technology		Prüfung (PR)	Schneider
WS 18/19	76-T-MACH-102102	Physical Basics of Laser Technology		Prüfung (PR)	Schneider

Competence Certificate
oral examination (30 min)

no tools or reference materials

Prerequisites
It is not possible, to combine this brick with brick Laser Application in Automotive Engineering [T-MACH-105164] and brick Physical Basics of Laser Technology [T-MACH-109084]

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-105164 - Laser in Automotive Engineering must not have been started.

Recommendation
Basic knowledge of physics, chemistry and material science

Below you will find excerpts from events related to this course:

V Physical basics of laser technology

2181612, WS 18/19, 3 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

lecture notes via ILIAS

Learning Content
Based on the description of the physical basics about the formation and the properties of laser light the lecture goes through the different types of laser beam sources used in industry these days. The lecture focuses on the usage of lasers especially in materials engineering. Other areas like measurement technology or medical applications are also mentioned. An excursion to the laser laboratory of the Institute for Applied Materials (IAM) will be offered.

- physical basics of laser technology
- laser beam sources (solid state, diode, gas, liquid and other lasers)
- beam properties, guiding and shaping
- lasers in materials processing
- lasers in measurement technology
- lasers for medical applications
- savety aspects

The lecture is complemented by a tutorial.

Annotation
It is allowed to select only one of the lectures "Laser in automotive engineering" (2182642) or "Physical basics of laser technology" (2181612) during the Bachelor and Master studies.

Workload
regular attendance: 33,5 hours
self-study: 146,5 hours

Literature
W. T. Silfvast: Laser Fundamentals, 2008, Cambridge University Press

W. M. Steen: Laser Material Processing, 2010, Springer

T 3.174 Course: Physics for Engineers [T-MACH-100530]

Responsible: Prof. Dr. Martin Dienwiebel
Prof. Dr. Peter Gumbsch
Prof. Dr. Alexander Nesterov-Müller
Dr. Daniel Weygand

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	5	Each summer term	1

Events					
SS 2018	2142890	Physics for Engineers	2 SWS	Lecture (V)	Weygand, Dienwiebel, Nesterov-Müller, Gumbsch
SS 2018	8030087	Nachklausur „Physik für Ingenieure“	SWS	Written exam	Dienwiebel
Exams					
SS 2018	7600002	Physics for Engineers		Prüfung (PR)	Dienwiebel, Nesterov-Müller
SS 2018	7600009	Physics for Engineers		Prüfung (PR)	Dienwiebel, Nesterov-Müller
SS 2018	76-T-MACH-100530	Physics for Engineers		Prüfung (PR)	Gumbsch, Weygand, Nesterov-Müller, Dienwiebel
WS 18/19	76-T-MACH-100530	Physics for Engineers		Prüfung (PR)	Gumbsch, Dienwiebel, Nesterov-Müller, Weygand

Competence Certificate
written exam 90 min

Prerequisites
none

Below you will find excerpts from events related to this course:

V Physics for Engineers

2142890, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1) Foundations of solid state physics

- Wave particle dualism
- Tunnelling
- Schrödinger equation
- H-atom

2) Electrical conductivity of solids

- solid state: periodic potentials
- Pauli Principle
- band structure
- metals, semiconductors and isolators
- p-n junction / diode

3) Optics

- quantum mechanical principles of the laser
- linear optics
- non-linear optics

Exercises (2142891, 2 SWS) are used for complementing and deepening the contents of the lecture as well as for answering more extensive questions raised by the students and for testing progress in learning of the topics.

Workload
regular attendance: 22,5 hours (lecture) and 22,5 hours (excerises 2142891)
self-study: 97,5 hours and 49 hours (excerises 2142891)

Literature

- Tipler und Mosca: Physik für Wissenschaftler und Ingenieure, Elsevier, 2004
- Haken und Wolf: Atom- und Quantenphysik. Einführung in die experimentellen und theoretischen Grundlagen, 7. Aufl., Springer, 2000
- Harris, Moderne Physik, Pearson Verlag, 2013

T 3.175 Course: PLM for Product Development in Mechatronics [T-MACH-102181]

Responsible: Prof. Dr.-Ing. Martin Eigner
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2122376	PLM for product development in mechatronics	SWS	Lecture (V)	Eigner
Exams					
SS 2018	76-T-MACH-102181	PLM for Product Development in Mechatronics		Prüfung (PR)	Eigner
WS 18/19	76-T-MACH-102181	PLM for Product Development in Mechatronics		Prüfung (PR)	Eigner

Competence Certificate
Oral examination 20 min.

Prerequisites
none

Below you will find excerpts from events related to this course:

V PLM for product development in mechatronics

2122376, SS 2018, SWS, Open in study portal

Lecture (V)

Workload
The total workload for this course is approximately 120 hours. For further information see German version.

T 3.176 Course: PLM-CAD Workshop [T-MACH-102153]

Responsible: Prof. Dr.-Ing. Jivka Ovtcharova
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement

Type	Credits	Recurrence	Version
Prüfungsleistung anderer Art	4	Each term	2

Events					
SS 2018	2121357	PLM-CAD Workshop	4 SWS	Practical course (P)	Ovtcharova, Mitarbeiter
WS 18/19	2121357	PLM-CAD Workshop	4 SWS	Seminar / Practical course (S/P)	Ovtcharova, Mitarbeiter
Exams					
SS 2018	76-T-MACH-102153	PLM-CAD Workshop		Prüfung (PR)	Ovtcharova
WS 18/19	76-T-MACH-102153	PLM-CAD Workshop		Prüfung (PR)	Ovtcharova

Competence Certificate
Alternative exam assessment (graded)

Prerequisites
None

Annotation
Number of participants is limited, compulsory attendance

T 3.177 Course: Polymer Engineering I [T-MACH-102137]

Responsible: Prof. Dr.-Ing. Peter Elsner
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2173590	Polymer Engineering I	2 SWS	Lecture (V)	Elsner, Weidenmann
Exams					
SS 2018	76-T-MACH-102137	Polymer Engineering I		Prüfung (PR)	Elsner
WS 18/19	76-T-MACH-102137	Polymer Engineering I		Prüfung (PR)	Elsner

Competence Certificate
Oral exam, about 25 minutes

Prerequisites
none

Below you will find excerpts from events related to this course:

V Polymer Engineering I

2173590, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. Economical aspects of polymers
2. Introductiom of mechanical,
chemical end electrical properties
3. Processing of polymers
(introduction)
4. Material science of polymers
5. Synthesis

Workload
regular attendance: 21 hours
self-study: 99 hours

Literature
Recommended literature and selected official lecture notes are provided in the lecture

T 3.178 Course: Powertrain Systems Technology A: Automotive Systems [T-MACH-105233]

Responsible: Prof. Dr.-Ing. Albert Albers
Sascha Ott

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	2

Events					
SS 2018	2146180	Powertrain Systems Technology A: Automotive Systems	2 SWS	Lecture (V)	Albers, Ott
Exams					
SS 2018	76-T-MACH-105233	Powertrain Systems Technology A: Automotive Systems		Prüfung (PR)	Albers
WS 18/19	76-T-MACH-105233	Powertrain Systems Technology A: Automotive Systems		Prüfung (PR)	Albers

Competence Certificate
written examination: 60 min duration

Prerequisites
None

Below you will find excerpts from events related to this course:

V Powertrain Systems Technology A: Automotive Systems

2146180, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Powertrain System

Driver System

Environment System

System Components

Development Process

Workload
regular attendance: 21 h

self-study: 99 h

Literature
Kirchner, E.; "Leistungsübertragung in Fahrzeuggetrieben: Grundlagen der Auslegung, Entwicklung und Validierung von Fahrzeuggetrieben und deren Komponenten", Springer Verlag Berlin Heidelberg 2007

Naunheimer, H.; "Fahrzeuggetriebe: Grundlagen, Auswahl, Auslegung und Konstruktion", Springer Verlag Berlin Heidelberg 2007

T 3.179 Course: Powertrain Systems Technology B: Stationary Machinery [T-MACH-105216]

Responsible: Prof. Dr.-Ing. Albert Albers
Sascha Ott

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	2

Events					
WS 18/19	2145150	Powertrain Systems Technology B: Stationary Machinery	2 SWS	Lecture (V)	Albers, Ott
Exams					
SS 2018	76-T-MACH-105216	Powertrain Systems Technology B: Stationary Machinery		Prüfung (PR)	Albers
WS 18/19	76-T-MACH-105216	Powertrain Systems Technology B: Stationary Machinery		Prüfung (PR)	Albers

Competence Certificate
written examination: 60 min duration

Prerequisites
None

Below you will find excerpts from events related to this course:

V Powertrain Systems Technology B: Stationary Machinery

2145150, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Powertrain System

Operator System

Environment System

System Components

Development Process

Workload
regular attendance: 21 h

self-study: 99 h

Literature
VDI-2241: "Schaltare fremdbetätigte Reibkupplungen und -bremsen", VDI Verlag GmbH, Düsseldorf

Geilker, U.: "Industriekupplungen - Funktion, Auslegung, Anwendung", Die Bibliothek der Technik, Band 178, verlag moderne industrie, 1999

T 3.180 Course: Practical Training in Measurement of Vibrations [T-MACH-105373]

Responsible: Prof. Dr.-Ing. Alexander Fidlin
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104442 - Schwerpunkt: Schwingungslehre

Type	Credits	Recurrence	Version
Studienleistung	4	Each summer term	1

Events					
SS 2018	2162208	Schwingungstechnisches Praktikum	SWS	Practical course (P)	Fidlin, Burgert
Exams					
SS 2018	76-T-MACH-105373	Practical Training in Measurement of Vibrations		Prüfung (PR)	Fidlin
WS 18/19	76-T-MACH-105373	Practical Training in Measurement of Vibrations		Prüfung (PR)	Fidlin

Competence Certificate
Colloquium to each session, 10 out of 10 colloquiums must be passed

Prerequisites
Can not be combined with Experimental Dynamics (T-MACH-105514).

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-105514 - Experimental Dynamics must not have been started.

Recommendation
Vibration Theory, Mathematical Methods of Vibration Theory, Dynamic Stability, Nonlinear Vibrations

T 3.181 Course: Presentation [T-MACH-109189]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-104494 - Bachelorarbeit

Type	Credits	Recurrence	Version
Studienleistung	3	Each term	1

Exams				
WS 18/19	76-T-MACH-109189	Presentation	Prüfung (PR)	

Competence Certificate
The colloquium presentation must be held within 6 weeks after the submission of the bachelor thesis. The presentation should last around 20 minutes followed by a scientific discussion with the present expert audience. The students should show that they are able to independently present and discuss the content of their bachelor thesis according to scientific criteria.

Prerequisites
Bachelor Thesis has been started

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-109188 - Bachelor Thesis must have been started.

Annotation
The workload for the presentation of the bachelor thesis is about 90 hours.

T 3.182 Course: Principles of Ceramic and Powder Metallurgy Processing [T-MACH-102111]

Responsible: Dr. Günter Schell
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2193010	Basic principles of powder metallurgical and ceramic processing	2 SWS	Lecture (V)	Schell
Exams					
SS 2018	76-T-MACH-102111	Principles of Ceramic and Powder Metallurgy Processing		Prüfung (PR)	Schell
WS 18/19	76-T-MACH-102111	Principles of Ceramic and Powder Metallurgy Processing		Prüfung (PR)	Schell

Competence Certificate
The assessment consists of an oral exam (20-30 min) taking place at the agreed date. The re-examination is offered upon agreement.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Basic principles of powder metallurgical and ceramic processing

2193010, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
The course covers fundamentals of the process technology for shaping of ceramic or metal particle systems. Important shaping methods are reviewed. The focus is on characterization and properties of particulate systems, and, in particular, on process technology for shaping of powders, pastes, and suspensions.

Workload
regular attendance: 25 hours
self-study: 95 hours

Literature

- R.J. Brook: Processing of Ceramics I+II, VCH Weinheim, 1996
- M.N. Rahaman: Cermamic Processing and Sintering, 2nd Ed., Marcel Dekker, 2003
- W. Schatt ; K.-P. Wieters ; B. Kieback. ".Pulvermetallurgie: Technologien und Werkstoffe", Springer, 2007
- R.M. German. "Powder metallurgy and particulate materials processing. Metal Powder Industries Federation, 2005
- F. Thümmler, R. Oberacker. "Introduction to Powder Metallurgy", Institute of Materials, 1993

T 3.183 Course: Product Lifecycle Management [T-MACH-105147]

Responsible: Prof. Dr.-Ing. Jivka Ovtcharova
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement
M-MACH-102589 - Schwerpunkt: Produktionssysteme
M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	2

Events					
WS 18/19	2121350	Product Lifecycle Management	2 SWS	Lecture (V)	Ovtcharova
Exams					
SS 2018	76-T-MACH-105147	Product Lifecycle Management		Prüfung (PR)	Ovtcharova
WS 18/19	76-T-MACH-105147	Product Lifecycle Management		Prüfung (PR)	Ovtcharova

Competence Certificate
Writen examination 90 min.

Prerequisites
None

Below you will find excerpts from events related to this course:

V Product Lifecycle Management

2121350, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Product Lifecycle Management (PLM) is an approach to the holistic and cross-company management and control of all product-related processes and data throughout the life cycle along the extended supply chain - from design and production to sales, to the dismantling and recycling.

Product Lifecycle Management is a comprehensive approach for effective and efficient design of the product life cycle. Based on all product information, which comes up across the entire value chain and across multiple partners, processes, methods and tools are made available to provide the right information at the right time, quality and the right place.

The course covers:

- A consistent description of all business processes that occur during the product life cycle (development, production, sales, dismantling, ...)
- the presentation of methods for the performance of the PLM business processes,
- explaining the most important corporate information systems to support the life cycle (PDM, ERP, SCM, CRM systems) to sample the software manufacturer SAP

Workload
regular attendance: 42 hours
self-study: 128 hours

Literature
Lecture slides.

V. Arnold et al: Product Lifecycle Management beherrschen, Springer-Verlag, Heidelberg, 2005.

J. Stark: Product Lifecycle Management, 21st Century Paradigm for Product Realisation, Springer-Verlag, London, 2006.

A. W. Scheer et al: Prozessorientiertes Product Lifecycle Management, Springer-Verlag, Berlin, 2006.

J. Schöttner: Produktdatenmanagement in der Fertigungsindustrie, Hanser-Verlag, München, 1999.

M.Eigner, R. Stelzer: Produktdaten Management-Systeme, Springer-Verlag, Berlin, 2001.

G. Hartmann: Product Lifecycle Management with SAP, Galileo press, 2007.

K. Obermann: CAD/CAM/PLM-Handbuch, 2004.

T 3.184 Course: Product, Process and Resource Integration in the Automotive Industry [T-MACH-102155]

Responsible: Prof. Dr.-Ing. Jivka Ovtcharova
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	2

Events					
SS 2018	2123364	Product, Process and Resource Integration in the Automotive Industry	2 SWS	Lecture (V)	Mbang
Exams					
SS 2018	76-T-MACH-102155	Product, Process and Resource Integration in the Automotive Industry		Prüfung (PR)	Mbang
WS 18/19	76-T-MACH-102155	Product, Process and Resource Integration in the Automotive Industry		Prüfung (PR)	Mbang

Competence Certificate
Oral examination 20 min.

Prerequisites
None

Annotation
Limited number of participants.

Below you will find excerpts from events related to this course:

V Product, Process and Resource Integration in the Automotive Industry
2123364, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
The lecture

- Overview of product development in the automotive sector (process- and work cycle, IT-Systems)
- Integrated product models in the automotive industry (product, process and resource)
- New CAx modeling methods (intelligent feature technology, templates & functional modeling)
- Automation and knowledge-based mechanism for product design and production planning
- Product development in accordance with defined process and requirement (3D-master principle, tolerance models)
- Concurrent Engineering, shared working
- Enhanced concepts: the digital and virtual factory (application of virtual technologies and methods in the product development)
- Systems: Siemens NX .

Additionally, A practical industrial project study is offered, which is based on an integrated application scenario (from design of production resources, over testing and validation method planning to the manufacturing and implementation of the production resources).

Since the student will be divided in small teams, this study will also teach the students about team word and distributed development.

Annotation
Max. 20 students, registration necessary (ILIAS)

Workload
regular attendance: 32 hours
self-study: 72 hours

Literature
Lecture slides

T 3.185 Course: Production and Logistics Controlling [T-WIWI-103091]

Responsible: Alexander Rausch
Organisation: KIT Department of Economics and Management
Part of: M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	3	Each winter term	1

Events					
WS 18/19	2500005	Produktions- und Logistikcontrolling	2 SWS	Lecture (V)	Rausch
Exams					
SS 2018	79-T-WIWI-103091	Production and Logistics Controlling		Prüfung (PR)	Furmans, Mittwollen
WS 18/19	79-T-WIWI-103091	Production and Logistics Controlling		Prüfung (PR)	Furmans

Competence Certificate
The assessment consists of a written exam (60 minutes) following §4(2), 1 of the examination regulation.
The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Prerequisites
None

Below you will find excerpts from events related to this course:

V Produktions- und Logistikcontrolling

2500005, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. Overview of Controlling
2. Performance Measurement
3. Planning
4. Reporting
5. Deviation Analysis

T 3.186 Course: Production Operations Management [T-MACH-100304]

Responsible: Prof. Dr.-Ing. Kai Furmans
Prof. Dr.-Ing. Gisela Lanza
Prof. Dr. Frank Schultmann

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-100297 - Betriebliche Produktionswirtschaft

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	3	Each winter term	2

Events					
SS 2018	2110085	Production Operations Management	4 SWS	Lecture / Practice (VÜ)	Furmans, Lanza
WS 18/19	2110085	Production Operations Management	2 SWS	Lecture / Practice (VÜ)	Furmans, Lanza
WS 18/19	3118031	Production Operations Management	3 SWS	Lecture / Practice (VÜ)	Furmans, Lanza
Exams					
SS 2018	76-T-MACH-100304	Production Operations Management		Prüfung (PR)	Furmans, Lanza
WS 18/19	76-T-MACH-100304	Production Operations Management		Prüfung (PR)	Furmans, Lanza, Deml

Competence Certificate
written exam (duration: 90 min)

Prerequisites
T-MACH-108734 - Production Operations Management-Project must have been completed successfully.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-108734 - Production Operations Management-Project must have been passed.

Below you will find excerpts from events related to this course:

V Production Operations Management

2110085, SS 2018, 4 SWS, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

Lecture notes will be provided in Ilias (https://ilias.studium.kit.edu/).

Learning Content
The lecture is given in cooperation by the Institute for Conveying Technologies and Logistics (IFL) and the Institute of Production Science (wbk).Basic skills are taught about the planning and operation of a production system. Contents of the lecture are the basics of operational and supply chain management as well as business administration basics for accounting, investment calculation and legal forms.

Annotation
None

Workload
regular attendance: 42 hours
self-study: 108 hours

Literature
Lecture Notes

V **Production Operations Management** **Lecture / Practice (VÜ)**
2110085, WS 18/19, 2 SWS, Open in study portal

Description
Media:

Lecture notes will be provided in ilias (https://ilias.studium.kit.edu/).

Learning Content
The lecture covers the basics of operations and supply chain management as well as business management basics in accounting, investment calculation and legal forms.

Annotation
It is a joint lecture of the Institute of Materials Handling and Logistics (IFL) and the Institute of Production Science (WBK). The institutes alternate with each cycle.

Workload
regular attendance: 25 hours
self-study: 65 hours

Literature
F. Robert Jacobs, Richard B. Chase (2014): Operations and supply chain management

T 3.187 Course: Production Operations Management-Project [T-MACH-108734]

Responsible: Prof. Dr.-Ing. Kai Furmans
Prof. Dr.-Ing. Gisela Lanza

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-100297 - Betriebliche Produktionswirtschaft

Type	Credits	Recurrence	Version
Prüfungsleistung anderer Art	2	Each winter term	1

Events					
WS 18/19	2110086	Production Operations Management-Project	1 SWS	Project (PRO)	Furmans, Lanza
WS 18/19	3118032	Production Operations Management-Project	1 SWS	Project (PRO)	Furmans, Lanza
Exams					
WS 18/19	76-T-MACH-100305	Production Operations Management-Project		Prüfung (PR)	Furmans, Lanza

Competence Certificate

Assignments during the semester consisting of solving 5 and presenting 2 case studies, whereof:

- 80% assessment of the case study as group work
- 20% oral examination during case study colloquiums

Prerequisites

none

Below you will find excerpts from events related to this course:

V Production Operations Management-Project

2110086, WS 18/19, 1 SWS, Open in study portal

Project (PRO)

Learning Content

Students are divided into groups for this course. Five case studies will be carried out in these groups. The results of the group work will be presented and evaluated in writing. In addition, selected groups will present and defend their results. In the defences, the understanding of the models dealt with in the lecture is also tested.

The participation of all members of the selected groups in the oral defences is compulsory and controlled. Four written submissions must be passed and the best four out of five will be evaluated. For the written submission the group receives a common mark, in the defense each group member is evaluated individually. The defences are fully included in the evaluation, but they do not have to be passed in order to pass the lecture. The final score of the event consists of 80% of the written submissions and 20% of the defence evaluation.

Annotation

It is a joint lecture of the Institute of Materials Handling and Logistics (IFL) and the Institute of Production Science (WBK). The institutes alternate with each cycle.

Workload

Attendance time: 17 hours,

Self-study: 43 hours

Literature

F. Robert Jacobs, Richard B. Chase (2014): Operations and supply chain management

T 3.188 Course: Project Management in Global Product Engineering Structures [T-MACH-105347]

Responsible: Dr.-Ing. Peter Gutzmer
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement
M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2145182	Project management in Global Product Engineering Structures	2 SWS	Lecture (V)	Gutzmer
Exams					
SS 2018	76-T-MACH-105347	Project Management in Global Product Engineering Structures		Prüfung (PR)	Albers
WS 18/19	76-T-MACH-105347	Project Management in Global Product Engineering Structures		Prüfung (PR)	Albers

Competence Certificate
oral exam (20 min)

Aids: None

Prerequisites
none

Below you will find excerpts from events related to this course:

V Project management in Global Product Engineering Structures

2145182, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Product development process

Coordination of product development and handling of complexity

project management

matrix organization

planning / specification / target system

interaction of development and production

Workload
regular attendance: 21 h

self-study: 99 h

Literature
lecture notes

T 3.189 Course: Project Management in Rail Industry [T-MACH-104599]

Responsible: Prof. Dr.-Ing. Peter Gratzfeld
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102638 - Schwerpunkt: Bahnsystemtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2115995	Project Management in Rail Industry	2 SWS	Lecture (V)	Gratzfeld
Exams					
SS 2018	76-T-MACH-104599	Project Management in Rail Industry		Prüfung (PR)	Gratzfeld
WS 18/19	76-T-MACH-104599	Project Management in Rail Industry		Prüfung (PR)	Gratzfeld

Competence Certificate
Oral examination

Duration: 20 minutes

No tools or reference materials may be used during the exam.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Project Management in Rail Industry
2115995, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

All slides are available for download (Ilias-platform).

Notes
The lecture will be held for the last time in the winter term 2019. Exams can be taken until the end of the examination period of the winter term 2020.

Learning Content
Rail vehicles are capital-intensive goods which are manufactured in small series (like aircraft). The work to done at industry and customers is organized in "projects". This is completely different to the way of working in large-scale production (like car industry). Everybody working in this type of business is part of a project and should be aware of the typical processes.

The lecturer provides a comprehensive overview about modern project management for small series of capital-intensive goods. The content is valid not for rail vehicle business but also for other areas with similar business processes.
The following topics will be discussed:

1. Introduction: definition of project and project management
2. Project management system: project phases, main processes and supporting processes, governance
3. Organization: organizational structure within a company, project organization, roles in a project organization
4. Main processes: project start, project plan, work brake down structure, detailed project schedule, risk and opportunity management, change management, project closure
5. Governance

Annotation
None.

Workload
Regular attendance: 21 hours

Self-study: 21 hours

Exam and preparation: 78 hours

Literature
A bibliography is available for download (Ilias-platform).

T 3.190 Course: Project Workshop: Automotive Engineering [T-MACH-102156]

Responsible: Dr.-Ing. Michael Frey
Prof. Dr. Frank Gauterin
Dr.-Ing. Martin Gießler

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	6	Each term	1

Events					
SS 2018	2115817	Project Workshop: Automotive Engineering	3 SWS	Lecture (V)	Gauterin, Gießler, Frey
WS 18/19	2115817	Project Workshop: Automotive Engineering	3 SWS	Lecture (V)	Gauterin, Gießler, Frey
Exams					
SS 2018	76-T-MACH-102156	Project Workshop: Automotive Engineering		Prüfung (PR)	Gauterin
WS 18/19	76-T-MACH-102156	Project Workshop: Automotive Engineering		Prüfung (PR)	Gauterin

Competence Certificate
Oral examination

Duration: 30 up to 40 minutes

Auxiliary means: none

Prerequisites
none

Below you will find excerpts from events related to this course:

V Project Workshop: Automotive Engineering

2115817, SS 2018, 3 SWS, Open in study portal

Lecture (V)

Learning Content
During the Project Workshop Automotive Engineering a team of six persons will work on a task given by an German industrial partner using the instruments of project management. The task is relevant for the actual business and the results are intended to be industrialized after the completion of the project workshop.

The team will generate approaches in its own responsibility and will develop solutions for practical application. Coaching will be supplied by both, company and institute.

At the beginning in a start-up meeting goals and structure of the project will be specified. During the project workshop there will be weekly team meetings. Also a milestone meeting will be held together with persons from the industrial company. In a final presentation the project results will be presented to the company management and to institute representatives.

Annotation
Selection procedure, applications are to submit in the end of the preceding semester.

Workload
regular attendance: 49 hours
self-study:131 hours

Literature
Steinle, Claus; Bruch, Heike; Lawa, Dieter (Hrsg.), Projektmanagement, Instrument moderner Innovation, FAZ Verlag, Frankfurt a. M., 2001, ISBN 978-3929368277

The scripts will be supplied in the start-up meeting.

V

Project Workshop: Automotive Engineering

2115817, WS 18/19, 3 SWS, Open in study portal

Lecture (V)

Notes
Limited number of participants with selection procedure, in German language. Please send the application at the end of the previous semester
Date and room: see homepage of institute.

Learning Content
During the Project Workshop Automotive Engineering a team of six persons will work on a task given by an German industrial partner using the instruments of project management. The task is relevant for the actual business and the results are intended to be industrialized after the completion of the project workshop.

The team will generate approaches in its own responsibility and will develop solutions for practical application. Coaching will be supplied by both, company and institute.

At the beginning in a start-up meeting goals and structure of the project will be specified. During the project workshop there will be weekly team meetings. Also a milestone meeting will be held together with persons from the industrial company. In a final presentation the project results will be presented to the company management and to institute representatives.

Annotation
Selection procedure, applications are to submit in the end of the preceding semester.

Workload
regular attendance: 49 hours
self-study: 131 hours

Literature
Steinle, Claus; Bruch, Heike; Lawa, Dieter (Hrsg.), Projektmanagement, Instrument moderner Innovation, FAZ Verlag, Frankfurt a. M., 2001, ISBN 978-3929368277

The scripts will be supplied in the start-up meeting.

T 3.191 Course: Quality Management [T-MACH-102107]

Responsible: Prof. Dr.-Ing. Gisela Lanza
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102589 - Schwerpunkt: Produktionssysteme
M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	1

Events					
WS 18/19	2149667	Quality Management	2 SWS	Lecture (V)	Lanza
Exams					
SS 2018	76-T-MACH-102107	Quality Management		Prüfung (PR)	Lanza
WS 18/19	76-T-MACH-102107	Quality Management		Prüfung (PR)	Lanza

Competence Certificate
Written Exam (60 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Quality Management
2149667, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

Lecture notes will be provided in Ilias (https://ilias.studium.kit.edu/)

Learning Content
Based on the quality philosophies Total Quality Management (TQM) and Six Sigma, the lecture deals with the requirements of modern quality management. Within this context, the process concept of a modern enterprise and the process-specic elds of application of quality assurance methods are presented. The lecture covers the current state of the art in preventive and non-preventive quality management
methods in addition to manufacturing metrology, statistical methods and servicerelated quality management. The content is completed with the presentation of certication possibilities and legal quality aspects.
Main topics of the lecture:

- The term "quality"
- Total Quality Management (TQM) and Six Sigma
- Universal methods and tools
- QM during early product stages – product denition
- QM during product development and in procurement
- QM in production – manufacturing metrology
- QM in production – statistical methods
- QM in service
- Quality management systems
- Legal aspects of QM

Annotation
None

Workload
regular attendance: 21 hours
self-study: 99 hours

T 3.192 Course: Rail System Technology [T-MACH-106424]

Responsible: Prof. Dr.-Ing. Peter Gratzfeld
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102638 - Schwerpunkt: Bahnsystemtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each term	1

Events					
SS 2018	2115919	Rail System Technology	2 SWS	Lecture (V)	Gratzfeld
WS 18/19	2115919	Rail System Technology	2 SWS	Lecture (V)	Gratzfeld
Exams					
SS 2018	76-T-MACH-106424	Rail System Technology		Prüfung (PR)	Gratzfeld
WS 18/19	76-T-MACH-106424	Rail System Technology		Prüfung (PR)	Gratzfeld

Competence Certificate
Oral examination

Duration: 20 minutes

No tools or reference materials may be used during the exam.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Rail System Technology

2115919, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

All slides are available for download (Ilias-platform).

Learning Content

1. Railway System: railway as system, subsystems and interdependencies, definitions, laws, rules, railway and environment, economic impact
2. Operation: Transportation, public transport, regional transport, long-distance transport, freight service, scheduling
3. Infrastructure: rail facilities, track alignment, railway stations, clearance diagram
4. Wheel-rail-contact: carrying of vehicle mass, adhesion, wheel guidance, current return
5. Vehicle dynamics: tractive and brake effort, driving resistance, inertial force, load cycles
6. Signalling and Control: operating procedure, succession of trains, European Train Control System, blocking period, automatic train control
7. Traction power supply: power supply of rail vehicles, power networks, filling stations
8. History (optional)

Workload
Regular attendance: 21 hours

Self-study: 21 hours

Exam and preparation: 78 hours

Literature
A bibliography is available for download (Ilias-platform).

V

Rail System Technology

2115919, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

All slides are available for download (Ilias-platform).

Learning Content

1. Railway System: railway as system, subsystems and interdependencies, definitions, laws, rules, railway and environment, economic impact
2. Operation: Transportation, public transport, regional transport, long-distance transport, freight service, scheduling
3. Infrastructure: rail facilities, track alignment, railway stations, clearance diagram
4. Wheel-rail-contact: carrying of vehicle mass, adhesion, wheel guidance, current return
5. Vehicle dynamics: tractive and brake effort, driving resistance, inertial force, load cycles
6. Signalling and Control: operating procedure, succession of trains, European Train Control System, blocking period, automatic train control
7. Traction power supply: power supply of rail vehicles, power networks, filling stations
8. History (optional)

Workload
Regular attendance: 21 hours

Self-study: 21 hours

Exam and preparation: 78 hours

Literature
A bibliography is available for download (Ilias-platform).

T 3.193 Course: Rail Vehicle Technology [T-MACH-105353]

Responsible: Prof. Dr.-Ing. Peter Gratzfeld
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102638 - Schwerpunkt: Bahnsystemtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each term	1

Events					
SS 2018	2115996	Rail Vehicle Technology	2 SWS	Lecture (V)	Gratzfeld
WS 18/19	2115996	Rail Vehicle Technology	2 SWS	Lecture (V)	Gratzfeld
Exams					
SS 2018	76-T-MACH-105353	Rail Vehicle Technology		Prüfung (PR)	Gratzfeld
WS 18/19	76-T-MACH-105353	Rail Vehicle Technology		Prüfung (PR)	Gratzfeld

Competence Certificate
Oral examination

Duration: 20 minutes

No tools or reference materials may be used during the exam.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Rail Vehicle Technology

2115996, SS 2018, 2 SWS, Open in study portal **Lecture (V)**

Description
Media:

All slides are available for download (Ilias-platform).

Learning Content
Vehicle system technology: structure and main systems of rail vehicles

Drives: Electric and non-electric traction drives

Brakes: Tasks, basics, principles, brake control

Bogies: forces, running gears, axle configuration

Vehicle concepts: trams, metros, regional trains, double deck coaches, locomotives

Examples of existing rail vehicles were discussed.

Workload
Regular attendance: 21 hours

Self-study: 21 hours

Exam and preparation: 78 hours

Literature
A bibliography is available for download (Ilias-platform).

V Rail Vehicle Technology

2115996, WS 18/19, 2 SWS, Open in study portal **Lecture (V)**

Learning Content

1. System structure of rail vehicles: tasks and classification of rail vehicles, main systems, vehicle system technology
2. Drives: Electric and non-electric traction drives
3. Brakes: Tasks, basics, principles, brake control
4. Bogies: forces, running gears, axle configuration
5. Vehicle concepts: trams, metros, regional trains, high speed trains, double deck coaches, locomotives.
   Examples of existing rail vehicles were discussed.

Workload
Regular attendance: 21 hours

Self-study: 21 hours

Exam and preparation: 78 hours

Literature
A bibliography is available for download (Ilias-platform).

T 3.194 Course: Railways in the Transportation Market [T-MACH-105540]

Responsible: Prof. Dr.-Ing. Peter Gratzfeld
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102638 - Schwerpunkt: Bahnsystemtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2114914	Railways in the Transportation Market	2 SWS	Block lecture (BV)	Gratzfeld
Exams					
SS 2018	76-T-MACH-105540	Railways in the Transportation Market		Prüfung (PR)	Gratzfeld
WS 18/19	76-T-MACH-105540	Railways in the Transportation Market		Prüfung (PR)	Gratzfeld

Competence Certificate
Oral examination

Duration: 20 minutes

No tools or reference materials may be used during the exam.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Railways in the Transportation Market
2114914, SS 2018, 2 SWS, Open in study portal

Block lecture (BV)

Description
Media:

All material is available for download (Ilias-platform).

Learning Content
The lecture gives an overview about perspective, challenges and chances of rail systems in the national and European market. Following items will be discussed:

- Introduction and basics
- Rail reform
- Overview of Deutsche Bahn
- Development of infrastructure
- Regulation of railways
- Intra- and intermodal competition
- Field of actions in transport policy
- Railways and enviroment
- Trends in the transportation market
- Future of Deutsche Bahn, DB 2020
- Integration of traffic carriers
- International passenger and freight transportation

Workload
Regular attendance: 21 hours

Self-study: 21 hours

Exam and preparation: 78 hours

Literature
none

T 3.195 Course: Reliability Engineering 1 [T-MACH-107447]

Responsible: Dr.-Ing. Alexei Konnov
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102817 - Schwerpunkt: Informationstechnik
M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	3	Each winter term	1

Events					
SS 2018	2169550	Reliability Engineering 1	2 SWS	Lecture (V)	Konnov
WS 18/19	2169550	Reliability Engineering 1	2 SWS	Lecture (V)	Konnov
Exams					
WS 18/19	76-T-MACH-107447	Reliability Engineering 1		Prüfung (PR)	

Competence Certificate
written exam

Prerequisites
none

Below you will find excerpts from events related to this course:

V Reliability Engineering 1
2169550, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Technical background: instrumentation and control systems in power plants

Introduction to reliability theory
Introduction to probability theory
Introduction to formal logic
Introduction to statistic

Workload
regular attandance: 25 h

self-study: 65 h

Literature
Lesson script (link will be available)

Recommended books:

o Birolini, Alessandro: *Reliability Engineering Theory and Practice*

o Pham, Hoang: *Handbook of reliability engineering*

V Reliability Engineering 1
2169550, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Technical background: instrumentation and control systems in power plants

Introduction to reliability theory
Introduction to probability theory
Introduction to formal logic
Introduction to statistic

Workload
regular attandance: 25 h

self-study: 65 h

Literature
Lesson script (link will be available)

Recommended books:

o Birolini, Alessandro: *Reliability Engineering Theory and Practice*

o Pham, Hoang: *Handbook of reliability engineering*

T 3.196 Course: Robotics I - Introduction to Robotics [T-INFO-108014]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Organisation: KIT Department of Informatics
Part of: M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	6	Each winter term	1

Events					
WS 18/19	2424152	Robotics I - Introduction to Robotics	3/1 SWS	Lecture (V)	Asfour, Kaiser, Paus, Beil
Exams					
SS 2018	7500218	Robotik I - Einführung in die Robotik		Prüfung (PR)	Asfour
WS 18/19	7500106	Robotics I - Introduction to Robotics		Prüfung (PR)	Asfour

T 3.197 Course: Safety Engineering [T-MACH-105171]

Responsible: Hans-Peter Kany
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	2

Events					
WS 18/19	2117061	Safety Engineering	2 SWS	Lecture (V)	Kany
Exams					
SS 2018	76-T-MACH-105171	Safety Engineering		Prüfung (PR)	Furmans
WS 18/19	7600020	Safety Engineering		Prüfung (PR)	Kany
WS 18/19	76-T-MACH-105171	Safety Engineering		Prüfung (PR)	Furmans

Competence Certificate
The assessment consists of an oral exam (20 min.) taking place in the recess period according to § 4 paragraph 2 Nr. 2 of the examination regulation.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Safety Engineering
2117061, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

presentations

Learning Content
The course provides basic knowledge of safety engineering. In particular the basics of health at the working place, job safety in Germany, national and European safety rules and the basics of safe machine design are covered. The implementation of these aspects will be illustrated by examples of material handling and storage technology. This course focuses on: basics of safety at work, safety regulations, basic safety principles of machine design, protection devices, system security with risk analysis, electronics in safety engineering, safety engineering for storage and material handling technique, electrical dangers and ergonomics. So, mainly, the technical measures of risk reduction in specific technical circumstances are covered.

Annotation
none

Workload
regular attendance: 21 hours
self-study: 99 hours

Literature
Defren/Wickert: Sicherheit für den Maschinen- und Anlagenbau, Druckerei und
Verlag: H. von Ameln, Ratingen, ISBN: 3-926069-06-6

T 3.198 Course: Scientific Computing for Engineers [T-MACH-100532]

Responsible: Prof. Dr. Peter Gumbsch
Dr. Daniel Weygand

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	5	Each winter term	2

Events					
WS 18/19	2181738	Scientific computing for Engineers	2 SWS	Lecture (V)	Weygand, Gumbsch
WS 18/19	2181739	Introduction to scientific computing	2 SWS	Practice (Ü)	Weygand
Exams					
SS 2018	76-T-MACH-100532	Scientific Computing for Engineers		Prüfung (PR)	Weygand, Gumbsch
WS 18/19	76-T-MACH-100532	Scientific Computing for Engineers		Prüfung (PR)	Weygand, Gumbsch

Competence Certificate
Written exam (90 minutes)

Prerequisites
The brick can not be combined with the brick "Application of advanced programming languages in mechanical engineering" (T-MACH-105390).

Below you will find excerpts from events related to this course:

V Scientific computing for Engineers

2181738, WS 18/19, 2 SWS, Open in study portal **Lecture (V)**

Learning Content
1. Introduction: why scientific computing
2. computer architectures
3. Introduction to Unix/Linux
4. Foundations of C++
* progamm organization
* data types, operator, control structures
* dynamic memory allocation
* functions
* class
* OpenMP parallelization
5. numeric /algorithms
* finite differences
* MD simulations: 2nd order differential equations
* algorithms for particle simulations
* solver for linear systems of eqns.

Annotation
The lecture can not be combined with the lecture "Application of advanced programming languages in mechanical engineering" (2182735).

Workload
regular attendance: 22,5 hours
Lab: 22,5 hours (optional)
self-study: 75 hours

Literature

1. C++: Einführung und professionelle Programmierung; U. Breymann, Hanser Verlag München
2. C++ and object-oriented numeric computing for Scientists and Engineers, Daoqui Yang, Springer Verlag.
3. The C++ Programming Language, Bjarne Stroustrup, Addison-Wesley
4. Die C++ Standardbibliothek, S. Kuhlins und M. Schader, Springer Verlag

Numerik:

1. Numerical recipes in C++ / C / Fortran (90), Cambridge University Press
2. Numerische Mathematik, H.R. Schwarz, Teubner Stuttgart
3. Numerische Simulation in der Moleküldynamik, Griebel, Knapek, Zumbusch, Caglar, Springer Verlag

V **Introduction to scientific computing** **Practice (Ü)**
2181739, WS 18/19, 2 SWS, Open in study portal

Learning Content
Exercises for the different topics of the lecture "Scientific computing for Engineers" (2181738)

Workload
regular attendance: 22,5 hours

Literature
lecture notes "Scientific computing for Engineers" (2181738)

T 3.199 Course: Selected Applications of Technical Logistics [T-MACH-102160]

Responsible: Viktor Milushev
Dr.-Ing. Martin Mittwollen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2118087	Selected Applications of Technical Logistics	3 SWS	Lecture (V)	Mittwollen, Milushev
Exams					
SS 2018	76-T-MACH-102160	Selected Applications of Technical Logistics		Prüfung (PR)	Mittwollen
WS 18/19	76-T-MACH-102160	Selected Applications of Technical Logistics		Prüfung (PR)	Mittwollen

Competence Certificate
The assessment consists of an oral exam (20 min.) taking place in the recess period according to § 4 paragraph 2 Nr. 2 of the examination regulation.

Prerequisites
none

Recommendation
Knowledge out of Basics of Technical Logistics (T-MACH-102163) / Elements and Systems of Technical Logistics (T-MACH-102159) preconditioned

Below you will find excerpts from events related to this course:

V Selected Applications of Technical Logistics

2118087, SS 2018, 3 SWS, Open in study portal

Lecture (V)

Description
Media:
supplementary sheets,projector, blackboard

Notes
Details according schedule will be published

Learning Content

- design and dimension of machines from intralogistics
- static and dynamic behaviour
- operation properties and specifics
- Inside practical lectures: sample applications and calculations in addition to the lectures

Annotation
Knowledge out of **Basics of Technical Logistics** preconditioned

Workload
presence: 36h

rework: 84h

Literature
Recommendations during lessons

T 3.200 Course: Selected Applications of Technical Logistics - Project [T-MACH-108945]

Responsible: Viktor Milushev
Dr.-Ing. Martin Mittwollen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung anderer Art	2	Each summer term	1

Exams				
WS 18/19	76-T-MACH-108945	Selected Applications of Technical Logistics - Project	Prüfung (PR)	Mittwollen

Competence Certificate
presentation of performed project and defense (30min) according to $4 (2), No. 3 of the examination regulation

Prerequisites
T-MACH-102160 (selected applications of technical logistics) must have been started

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-102160 - Selected Applications of Technical Logistics must have been started.

Recommendation
Knowledge out of Basics of Technical Logistics (T-MACH-102163) / Elements and Systems of Technical Logistics (T-MACH-102159) preconditioned

T 3.201 Course: Selected Problems of Applied Reactor Physics and Exercises [T-MACH-105462]

Responsible: Dr. Ron Dagan
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2190411	Selected Problems of Applied Reactor Physics and Exercises	2 SWS	Lecture (V)	Dagan
Exams					
SS 2018	76-T-MACH-105462	Selected Problems of Applied Reactor Physics and Exercises		Prüfung (PR)	Stieglitz, Dagan
WS 18/19	76-T-MACH-105462	Selected Problems of Applied Reactor Physics and Exercises		Prüfung (PR)	Dagan, Stieglitz

Competence Certificate
oral exam, 1/2 hour

Prerequisites
none

Below you will find excerpts from events related to this course:

V Selected Problems of Applied Reactor Physics and Exercises
Lecture (V)
2190411, SS 2018, 2 SWS, Open in study portal

Learning Content

- Nuclear energy and forces
- Radioactive decay
- Nuclear processes
- Fission and the importance of delayed neutrons
- Basics of nuclear cross sections
- Principles of chain reaction
- Static theory of mono energetic reactors
- Introduction to reactor kinetic
- student laboratory

Workload
Regular attendance: 26 h

self study 94 h

Literature
K. Wirtz Basics of Reactor technic Par I, II, Technic School Karlsruhe 1966 (in German)

D. Emendorfer. K.H. Höcker Theory of nuclear reactions, BI- Hochschultaschenbücher 1969 (in German)

J. Duderstadt and L. Hamilton, Nuclear reactor Analysis, J. Wiley $ Sons, Inc. 1975.

T 3.202 Course: Seminar for Rail System Technology [T-MACH-108692]

Responsible: Prof. Dr.-Ing. Peter Gratzfeld
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102638 - Schwerpunkt: Bahnsystemtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung anderer Art	3	Each term	2

Events					
SS 2018	2115009	Seminar for Rail System Technology	SWS	Seminar (S)	Gratzfeld
WS 18/19	2115009	Seminar for Rail System Technology	SWS	Seminar (S)	Gratzfeld
Exams					
SS 2018	76-T-MACH-00002	Seminar for Rail System Technology		Prüfung (PR)	Gratzfeld
WS 18/19	76-T-MACH-00002	Seminar for Rail System Technology		Prüfung (PR)	Gratzfeld

Competence Certificate
Examination: Writing a Seminararbeit, final presentation

Prerequisites
none

Below you will find excerpts from events related to this course:

V Seminar for Rail System Technology

2115009, SS 2018, SWS, Open in study portal

Seminar (S)

Notes
max. 10 participants

Learning Content

- Railway system: railway as system, subsystems and interdependencies, definitions, laws, rules, railway and environment, economic impact, history, challenges and future developments in the context of mega trends
- Operation: Transportation, public/regional/long-distance transport, freight service, scheduling
- System structure of railway vehicles: Tasks and classification, main systems
- Project management: definitions, project management, main and side processes, transfer to practice
- Scientific working: structuring and writing of scientific papers, literature research, scheduling (mile stones), self-management, presentation skills, using the software Citavi for literature and knowledge management, working with templates in Word, giving and taking feedback
- The learnt knowledge regarding scientific writing is used to elaborate a Seminararbeit. To this the students create a presentation, train and reflect it and finally present it to an auditorium.

Workload
Regular attendance: 21 hours

Self-study (writing Seminararbeit): 65 hours

Final presentation (including preparation): 4 hours

Literature
A bibliography is available for download (Ilias-platform).

V **Seminar for Rail System Technology**
2115009, WS 18/19, SWS, Open in study portal

Seminar (S)

Notes
max. 10 participants. Please check the homepage for further information.

Learning Content

- Railway system: railway as system, subsystems and interdependencies, definitions, laws, rules, railway and environment, economic impact, history, challenges and future developments in the context of mega trends
- Operation: Transportation, public/regional/long-distance transport, freight service, scheduling
- System structure of railway vehicles: Tasks and classification, main systems
- Project management: definitions, project management, main and side processes, transfer to practice
- Scientific working: structuring and writing of scientific papers, literature research, scheduling (mile stones), self-management, presentation skills, using the software Citavi for literature and knowledge management, working with templates in Word, giving and taking feedback
- The learnt knowledge regarding scientific writing is used to elaborate a Seminararbeit. To this the students create a presentation, train and reflect it and finally present it to an auditorium.

Workload
Regular attendance: 21 hours

Self-study (writing Seminararbeit): 65 hours

Final presentation (including preparation): 4 hours

Literature
A bibliography is available for download (Ilias-platform).

T 3.203 Course: Signals and Systems [T-ETIT-109313]

Responsible: Prof. Dr.-Ing. Fernando Puente León
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Expansion	Version
Prüfungsleistung schriftlich	6	Each winter term	1 terms	1

Events					
WS 18/19	2302109	Signale und Systeme	2 SWS	Lecture (V)	Puente León

Prerequisites
none

T 3.204 Course: Simulation of Coupled Systems [T-MACH-105172]

Responsible: Prof. Dr.-Ing. Marcus Geimer
Yusheng Xiang

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104430 - Schwerpunkt: Modellbildung und Simulation in der Dynamik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	2

Events					
SS 2018	2114095	Simulation of Coupled Systems	2 SWS	Lecture (V)	Geimer, Daiß, Becker
Exams					
SS 2018	76T-MACH-102172	Simulation of Coupled Systems		Prüfung (PR)	Geimer
SS 2018	76T-MACH-105172	Simulation of Coupled Systems		Prüfung (PR)	Geimer
SS 2018	76-T-MACH-105172	Simulation of Coupled Systems		Prüfung (PR)	Geimer
WS 18/19	76T-MACH-105172	Simulation of Coupled Systems		Prüfung (PR)	Geimer
WS 18/19	76-T-MACH-105172	Simulation of Coupled Systems		Prüfung (PR)	Geimer

Competence Certificate
The assessment consists of an oral exam (20 min) taking place in the recess period. The exam takes place in every semester. Re-examinations are offered at very ordinary examination date.

A registration in mandatory, the details will be announced on the webpages of the *Institute of Vehicle System Technology / Institute of Mobile Machines.* In case of too many applications, attendance will be granted based on pre-qualification.

Prerequisites
Required for the participation in the examination is the preparation of a report during the semester. The partial service with the code T-MACH-108888 must have been passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-108888 - Simulation of Coupled Systems - Advance must have been passed.

Recommendation

- Knowledge of ProE (ideally in actual version)
- Basic kniwledge of Matlab/Simulink
- Basic knowledge of dynamics of machnies
- Basic knowledge of hydraulics

Annotation
After completion of course, students are able to:

- build a coupled simulation
- parametrize models
- perform simulations
- conduct troubleshooting
- check results for plausibility

The number of participants is limited.

Content:

- Basics of multi-body and hydralics simulation programs
- Possibilities of coupled simulations
- Modelling and Simulation of Mobile Machines using a wheel loader
- Documentation of the result in a short report

Literature:

Software guide books (PDFs)

Information about wheel-type loader specifications

Below you will find excerpts from events related to this course:

V **Simulation of Coupled Systems** **Lecture (V)**
2114095, SS 2018, 2 SWS, Open in study portal

Learning Content

- Knowledge of the basics of multi-body and hydraulic simulation programs
- Possibilities of coupled simulations
- Development of a simulation model by using the example of a wheel loader
- Documentation of the result in a short report

Workload

- regular attendance: 21 hours
- total self-study: 92 hours

Literature
Elective literature:

- miscellaneous guides according the software-tools pdf-shaped
- information to the wheel-type loader

T 3.205 Course: Simulation of Coupled Systems - Advance [T-MACH-108888]

Responsible: Prof. Dr.-Ing. Marcus Geimer
Yusheng Xiang

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104430 - Schwerpunkt: Modellbildung und Simulation in der Dynamik

Type	Credits	Recurrence	Version
Studienleistung	0	Each summer term	1

Exams				
WS 18/19	76-T-MACH-108888	Simulation of Coupled Systems - Advance	Prüfung (PR)	Geimer

Competence Certificate
Preparation of semester report

Prerequisites
none

T 3.206 Course: SmartFactory@Industry (MEI) [T-MACH-106733]

Responsible: Prof. Dr.-Ing. Gisela Lanza
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102644 - Schwerpunkt: Production Engineering

Type	Credits	Recurrence	Version
Prüfungsleistung anderer Art	4	Each summer term	1

Events					
SS 2018	3150044	SmartFactory@Industry	2 SWS	Seminar / Practical course (S/P)	Lanza
Exams					
WS 18/19	76-T-MACH-106733	SmartFactory@Industry (MEI)		Prüfung (PR)	Lanza

Competence Certificate
alternative test achievement (graded)

- colloquium (approx. 15 min)
- presentation (approx. 20 min)

Prerequisites
Successful completion of the following courses:

- M-MACH-102563 - Computer Science
- MACH-102573 - Mechanical Design

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-MACH-102563 - Computer Science must have been passed.
2. The module M-MACH-102573 - Mechanical Design must have been passed.

Below you will find excerpts from events related to this course:

V SmartFactory@Industry
3150044, SS 2018, 2 SWS, Open in study portal

Seminar / Practical course (S/P)

Learning Content
The students will get to know different real industrial tasks and problems and will learn how to address them with the methods they got to know and even beyond these.

Annotation
For organizational reasons the number of participants for the course is limited. Hence a selection process will take place.

The course is held as block modules.

T 3.207 Course: Solar Thermal Energy Systems [T-MACH-106493]

Responsible: Dr. Ron Dagan
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	2

Events					
WS 18/19	2189400	Solar Thermal Energy Systems	SWS	Lecture (V)	Dagan
Exams					
SS 2018	76-T-MACH-106493	Solar Thermal Energy Systems		Prüfung (PR)	Stieglitz, Dagan
WS 18/19	76-T-MACH-106493	Solar Thermal Energy Systems		Prüfung (PR)	Dagan, Stieglitz

Competence Certificate
oral exam. 30 minutes

Prerequisites
none

Below you will find excerpts from events related to this course:

V Solar Thermal Energy Systems
2189400, WS 18/19, SWS, Open in study portal

Lecture (V)

Learning Content
I. Introduction to solar energy: Energy resources, consumption and costs

II. The sun as an energy resource:

Structure of the sun, Black body radiation, solar constant, solar spectral distribution

Sun-Earth geometrical relationship

III. Passive and active solar thermal applications.

IV. Fundamentals of thermodynamics and heat transfer

V. Solar thermal systems - solar collector-types, concentrating collectors, solar towers. Heat losses and efficiency

VII. Energy storage

The course deals with fundamental aspects of solar energy. Starting from a global energy panorama the course deals with the sun as a thermal energy source. In this context, basic issues such as the sun's structure, blackbody radiation and solar–earth geometrical relationship are discussed. In the next part, the lectures cover passive and active thermal applications and review various solar collector types including concentrating collectors and solar towers and the concept of solar tracking. Further, the collector design parameters determination is elaborated, leading to improved efficiency. This topic is augmented by a review of the main laws of thermodynamics and relevant heat transfer mechanisms.

The course ends with an overview on energy storage concepts which enhance practically the benefits of solar thermal energy systems.

Workload
Total 90 h, hereof 30 h contact hours and 60 h homework and self-studies

T 3.208 Course: Strategic product development - identification of potentials of innovative products [T-MACH-105696]

Responsible: Dr.-Ing. Andreas Siebe
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2146198	Strategic product development - identification of potentials of innovative products	2 SWS	Lecture (V)	Siebe
Exams					
SS 2018	76-T-MACH-105696	Strategic product development - identification of potentials of innovative products		Prüfung (PR)	Albers
WS 18/19	76-T-MACH-105696	Strategic product development - identification of potentials of innovative products		Prüfung (PR)	Albers

Competence Certificate
oral exam (20 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Strategic product development - identification of potentials of innovative products

Lecture (V)

2146198, SS 2018, 2 SWS, Open in study portal

Learning Content
Introduction into future management, Development of scenarios, scenariobased strategy development, trendmanagement, strategic early detection, innovation- and technologymanagement, scenarios in product development, from profiles of requirements to new products, examples out of industrial praxis.

Workload
regular attendance: 21 h

self-study: 99 h

T 3.209 Course: Supply Chain Management [T-MACH-105181]

Responsible: Dr.-Ing. Knut Alicke
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	6	Each winter term	1

Events					
WS 18/19	2117062	Supply chain management	3 SWS	Lecture (V)	Alicke
WS 18/19	2117063	Übungen zu 'Supply chain management ' (mach und wiwi)	1 SWS	Practice (Ü)	Alicke
Exams					
SS 2018	76-T-MACH-105181	Supply Chain Management		Prüfung (PR)	Furmans
WS 18/19	76-T-MACH-105181	Supply Chain Management		Prüfung (PR)	Furmans

Competence Certificate
The assessment consists of an oral exam (20 min.) taking place in the recess period according to § 4 paragraph 2 Nr. 2 of the examination regulation.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Supply chain management

2117062, WS 18/19, 3 SWS, Open in study portal

Lecture (V)

Description
Media:

presentations

Learning Content

- Bullwhip-Effect, Demand Planning & Forecasting
- Conventional planning processes (MRP + MRPII)
- Stock keeping strategy
- Data acquisition and analysis
- Design for logistics (Postponement, Mass Customization, etc.)
- Logistic partnerships (VMI, etc.)
- Distribution structures (central vs. distributed, Hub&Spoke)
- SCM-metrics (performance measurement) e-business
- Special sectors as well as guest lectures

Workload
regular attendance: 42 hours
self-study: 138 hours

Literature
Alicke, K.: Planung und Betrieb von Logistiknetzwerken

Simchi-Levi, D., Kaminsky, P.: Designing and Managing the Supply Chain

Goldratt, E., Cox, J.: The Goal

T 3.210 Course: Sustainable Product Engineering [T-MACH-105358]

Responsible: Dr. Karl-Friedrich Ziegahn
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement
M-MACH-102812 - Schwerpunkt: Antriebssysteme
M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	1

Events					
SS 2018	2146192	Sustainable Product Engineering	2 SWS	Lecture (V)	Ziegahn
Exams					
SS 2018	76-T-MACH-105358	Sustainable Product Engineering		Prüfung (PR)	Albers
WS 18/19	76-T-MACH-105358	Sustainable Product Engineering		Prüfung (PR)	Albers

Competence Certificate
written exam (60 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V Sustainable Product Engineering
2146192, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
understanding of sustainability objectives and their role in product development, the interaction between technical products and their environment, the holistic approach and the equality of economic, social and environmental aspects and environmental aspects

skills for life-cycle product design using the example of complex automotive components such as airbag systems and other current products

understanding of product environmental stresses with relevancy to praxis at the example of technology-intensive components, robustness and durability of products as the basis for a sustainable product development, development of skills for the application of environmental simulationduring the process of developement of technical products

delivery of key skills such as team skills / project / self / presentation based on realistic projects

Workload
regular attendance: 21 h

self-study: 99 h

T 3.211 Course: System Integration in Micro- and Nanotechnology [T-MACH-105555]

Responsible: Dr. Ulrich Gengenbach
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2106033	System Integration in Micro- and Nanotechnology	2 SWS	Lecture (V)	Gengenbach
Exams					
SS 2018	76-T-MACH-105555	System Integration in Micro- and Nanotechnology		Prüfung (PR)	Hagenmeyer
WS 18/19	76-T-MACH-105555	System Integration in Micro- and Nanotechnology		Prüfung (PR)	Hagenmeyer

Competence Certificate
oral exam (Duration: 30 min)

Prerequisites
none

Below you will find excerpts from events related to this course:

V System Integration in Micro- and Nanotechnology

2106033, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content

- Introduction
- Definition system integration
- Integration of mechanical functions (flexures)
- Plasma treatment of surfaces
- Adhesive bonding
    - Packaging
    - Low Temperature Cofired Ceramics (LTCC)
    - Assembly of hybrid systems

- Monolithic/hybrid system integration)
- Modular system integration

- Integration of electrical/electronic functions
- Mounting techniques
- molded Interconnect Devices (MID)
- Functional printing

- Coating
- Capping
- Housing

First steps towards system integration nanotechnology

Literature

- A. Risse, Fertigungsverfahren der Mechatronik, Feinwerk- und Präzisionsgerätetechnik, Vieweg+Teubner Verlag Wiesbaden, 2012
- M. Madou, Fundamentals of microfabrication and nanotechnology, CRC Press Boca raton, 2012
- G. Habenicht, Kleben Grundlagen, Technologien, Anwendungen, Springer-Verlag Berlin Heidelberg, 2009
- J. Franke, Räumliche elektronische Baugruppen (3D-MID), Carl Hanser-Verlag München, 2013

T 3.212 Course: Systematic Materials Selection [T-MACH-100531]

Responsible: Dr.-Ing. Stefan Dietrich
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	3

Events					
SS 2018	2174576	Systematic Materials Selection	3 SWS	Lecture (V)	Dietrich
SS 2018	2174577	Übungen zu 'Systematische Werkstoffauswahl'	1 SWS	Practice (Ü)	Dietrich, Mitarbeiter
Exams					
SS 2018	76-T-MACH-100531	Systematic Materials Selection		Prüfung (PR)	Dietrich
WS 18/19	76-T-MACH-100531	Systematic Materials Selection		Prüfung (PR)	Dietrich

Competence Certificate
The assessment is carried out as a written exam of 2 h.

Prerequisites
M-MACH-102562 - Materials Science must be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-MACH-102562 - Materials Science must have been passed.

Recommendation
Basic knowledge in materials science, mechanics and mechanical design due to the lecture Materials Science I/II.

Below you will find excerpts from events related to this course:

V Systematic Materials Selection

2174576, SS 2018, 3 SWS, Open in study portal

Lecture (V)

Learning Content
Important aspects and criteria of materials selection are examined and guidelines for a systematic approach to materials selection are deeloped. The following topics are covered:

- Information and introduction
- Necessary basics of materials
- Selected methods / approaches of the material selection
- Examples for material indices and materials property charts
- Trade-off and shape factors
- Sandwich materials and composite materials
- High temperature alloys
- Regard of process influences
- Material selection for production lines
- Incorrect material selection and the resulting consequences
- Abstract and possibility to ask questions

Workload
The workload for the lecture is 150 h per semester and consists of the presence during the lecture (30 h) as well as preparation and rework time at home (120 h).

Literature
Lecture notes; Problem sheets; Textbook: M.F. Ashby, A. Wanner (Hrsg.), C. Fleck (Hrsg.);
Materials Selection in Mechanical Design: Das Original mit Übersetzungshilfen
Easy-Reading-Ausgabe, 3. Aufl., Spektrum Akademischer Verlag, 2006
ISBN: 3-8274-1762-7

T 3.213 Course: Technical Design in Product Development [T-MACH-105361]

Responsible: Markus Schmid
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	1

Events					
SS 2018	2146179	Technical Design in Product Development	2 SWS	Lecture (V)	Schmid
Exams					
SS 2018	76-T-MACH-105361	Technical Design in Product Development		Prüfung (PR)	Albers
WS 18/19	76-T-MACH-105361	Technical Design in Product Development		Prüfung (PR)	Albers

Competence Certificate
Written exam (20 min)

Only dictionnary is allowed

Prerequisites
none

Below you will find excerpts from events related to this course:

V Technical Design in Product Development

2146179, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Introduction
Relevant parameters on product value in Technical Design
Design in Methodical Development and Engineering and for a differentiated validation of products
Design in the concept stage of Product Development
Design in the draft and elaboration stage of Product Development

Workload
regular attendance: 21 h

self-study: 99 h

Literature
Hexact (R) Lehr- und Lernportal

T 3.214 Course: Technical Thermodynamics and Heat Transfer I [T-MACH-104747]

Responsible: Prof. Dr. Ulrich Maas
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102574 - Technische Thermodynamik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	8	Each winter term	2

Events					
WS 18/19	2165501	Technical Thermodynamics and Heat Transfer I	4 SWS	Lecture (V)	Maas
WS 18/19	3165014	Technical Thermodynamics and Heat Transfer I	4 SWS	Lecture (V)	Schießl, Maas
Exams					
SS 2018	76-T-MACH-104747	Technical Thermodynamics and Heat Transfer I		Prüfung (PR)	Maas
WS 18/19	76-T-MACH-104747	Technical Thermodynamics and Heat Transfer I		Prüfung (PR)	Maas
WS 18/19	76-T-MACH-104747-english	Technical Thermodynamics and Heat Transfer I		Prüfung (PR)	Maas
WS 18/19	76-T-MACH-104747-Wiederholer	Technical Thermodynamics and Heat Transfer I		Prüfung (PR)	Maas

Competence Certificate
Written exam [duration: 180 min]

Prerequisites
Successful participation in the tutorial (T-MACH-105204 - Excercises in Technical Thermodynamics and Heat Transfer I)

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-105204 - Excercises in Technical Thermodynamics and Heat Transfer I must have been passed.

Below you will find excerpts from events related to this course:

V Technical Thermodynamics and Heat Transfer I

2165501, WS 18/19, 4 SWS, Open in study portal

Lecture (V)

Description
Media:

Blackboard and Powerpoint presentation

Learning Content
System, properties of state
Absolute temperature, model systems
1st law of thermodynamics for resting and moved systems
Entropy and 2nd law of thermodynamics
Behavior of real substances described by tables, diagrams and equations of state
Machine processes

Workload
Regular attendance: 56.3 h

Self-study: 183.8 h

Literature

Course note packet

Elsner, N.; Dittmann, A.: Energielehre und Stoffverhalten (Grundlagen der technischen Thermodynamik Bd. 1 und 2), 8. Aufl., Akademie-Verlag, 680 S. 1993.

Baehr, H.D.: Thermodynamik: eine Einführung in die Grundlagen und ihre technischen Anwendungen, 9. Aufl., Springer-Verlag, 460 S., 1996.

T 3.215 Course: Technical Thermodynamics and Heat Transfer II [T-MACH-105287]

Responsible: Prof. Dr. Ulrich Maas
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102574 - Technische Thermodynamik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	7	Each summer term	1

Events					
SS 2018	2166526	Technical Thermodynamics and Heat Transfer II	3 SWS	Lecture (V)	Maas
SS 2018	3166526	Technical Thermodynamics and Heat Transfer II	3 SWS	Lecture (V)	Schießl
Exams					
SS 2018	76-T-MACH-105287	Technical Thermodynamics and Heat Transfer II		Prüfung (PR)	Maas
WS 18/19	76-T-MACH-105287	Technical Thermodynamics and Heat Transfer II		Prüfung (PR)	Maas
WS 18/19	76-T-MACH-105287-english	Technical Thermodynamics and Heat Transfer II		Prüfung (PR)	Maas
WS 18/19	76-T-MACH-105287-Wiederholer	Technical Thermodynamics and Heat Transfer II		Prüfung (PR)	Maas

Competence Certificate
Written exam [duration: 180 min]

Prerequisites
Successful participation in the tutorial (T-MACH-105288 - Exercises in Technical Thermodynamics and Heat Transfer II)

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-105288 - Excercises in Technical Thermodynamics and Heat Transfer II must have been passed.

Below you will find excerpts from events related to this course:

V Technical Thermodynamics and Heat Transfer II

2166526, SS 2018, 3 SWS, Open in study portal

Lecture (V)

Description
Media:

Blackboard and Powerpoint presentation

Learning Content
Repetition of the topics of "Thermodynamics and Heat Transfer I"
Mixtures of ideal gases
Moist air
Behaviour of real substances described by equations of state
Applications of the laws of thermodynamics to chemical reactions

Workload
Regular attendance: 52,5 hours

Self-study: 142,5 hours

Literature
Course notes

Elsner, N.; Dittmann, A.: Energielehre und Stoffverhalten (Grundlagen der technischen Thermodynamik Bd. 1 und 2), 8. Aufl., Akademie-Verlag, 680 S. 1993.

Baehr, H.D.: Thermodynamik: eine Einführung in die Grundlagen und ihre technischen Anwendungen, 9. Aufl., Springer-Verlag, 460 S., 1996.

T 3.216 Course: Technology of Steel Components [T-MACH-105362]

Responsible: Prof. Dr.-Ing. Volker Schulze
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	2

Events					
SS 2018	2174579	Technology of steel components	2 SWS	Lecture (V)	Schulze
Exams					
SS 2018	76-T-MACH-105362	Technology of Steel Components		Prüfung (PR)	Schulze
WS 18/19	76-T-MACH-105362	Technology of Steel Components		Prüfung (PR)	Schulze

Competence Certificate
Oral exam, about 25 minutes

Prerequisites
M-MACH-102562 - Materials Science must be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-MACH-102562 - Materials Science must have been passed.

Below you will find excerpts from events related to this course:

V Technology of steel components — Lecture (V)
2174579, SS 2018, 2 SWS, Open in study portal

Learning Content
Meaning, Development and characterization of component states

Description of the influence of component state on mechanical properties

Stability of component states

Steel manufacturing

Component states due to forming

Component states due to heat treatments

Component states due to surface hardening

Component states due to machining

Component states due to mechanical surface treatments

Component states due to joining

Summarizing evaluation

Workload
regular attendance: 21 hours
self-study: 99 hours

Literature

Script will be distributed within the lecture

VDEh: Werkstoffkunde Stahl, Bd. 1: Grundlagen, Springer-Verlag, 1984

H.-J. Eckstein: Technologie der Wärmebehandlung von Stahl, Deutscher Verlag Grundstoffindustrie, 1977

H.K.D.H. Badeshia, R.W.K. Honeycombe, Steels - Microstructure and Properties, CIMA Publishing, 3. Auflage, 2006

V. Schulze: Modern Mechanical Surface Treatments, Wiley, Weinheim, 2005

T 3.217 Course: Theory of Stability [T-MACH-105372]

Responsible: Prof. Dr.-Ing. Alexander Fidlin
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104442 - Schwerpunkt: Schwingungslehre

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	6	Each summer term	1

Events					
SS 2018	2163113	Theory of Stability	2 SWS	Lecture (V)	Fidlin
SS 2018	2163114	Übungen zu Stabilitätstheorie	2 SWS	Practice (Ü)	Fidlin, Drozdetskaya
Exams					
SS 2018	76-T-MACH-105372	Theory of Stability		Prüfung (PR)	Fidlin
WS 18/19	76-T-MACH-105372	Theory of Stability		Prüfung (PR)	Fidlin

Competence Certificate
oral exam, 30 min.

Prerequisites
none

Recommendation
Vibration theory, Mathematical Methods of Vibration Theory

Below you will find excerpts from events related to this course:

V Theory of Stability

2163113, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content

- Basic concepts of stability
- Lyapunov's functions
- Direct lyapunov's methods
- Stability of equilibria positions
- Attraction area of a stable solution
- Stability according to the first order approximation
- Systems with parametric excitation
- Stability criteria in the control theory

Workload
time of attendance: 39 h
self-study: 201 h

Literature

- Pannovko Y.G., Gubanova I.I. Stability and Oscillations of Elastic Systems, Paradoxes, Fallacies and New Concepts. Consultants Bureau, 1965.

- Hagedorn P. Nichtlineare Schwingungen. Akademische Verlagsgesellschaft, 1978.

- Thomsen J.J. Vibration and Stability, Order and Chaos. McGraw-Hill, 1997.

T 3.218 Course: Thermal Solar Energy [T-MACH-105225]

Responsible: Prof. Dr. Robert Stieglitz
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2169472	Thermal Solar Energy	2 SWS	Lecture (V)	Stieglitz
Exams					
SS 2018	76-T-MACH-105225	Thermal Solar Energy		Prüfung (PR)	Stieglitz
WS 18/19	76-T-MACH-105225	Thermal Solar Energy		Prüfung (PR)	Stieglitz

Competence Certificate
Oral examination, 30 minutes

Prerequisites
none

Below you will find excerpts from events related to this course:

V Thermal Solar Energy

2169472, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Baiscs of thermal solar energy (radiation, heat conduction, storage, efficiency ….) Active and passive use of solar energy. Solar collectors (design types, efficiency, system technology). Solar plants (heliostats etc.). Solar climatization.
In detail:

1 Introduction to energy requirements and evaluation of the potential use of solar thermal energy.

2 Primary energy sources SUN: sun, solar constant, radiation (direct, diffuse scattering, absorption, impact angle, radiation balance).

3 Solar panels: schematic structure of a collector, fundamentals of efficiency, meaning of concentration and their limitations.

4 Passive solar mechanisms: heat conduction in solids and gases, radiation heat transfer in transparent and opaque bodies, selective absorber - typical materials and manufacturing processes.

5 Momentum and heat transport: basic equations of single and multiphase transport, calculation methods, stability limits.

optional

6 Low temperature solar thermal systems: Collector variants, methods for system simulation, planning and dimensioning of systems, system design and arrest scenarios.

6 High temperature solar thermal systems: solar towers and solar-farm concept, loss mechanisms, chimney power plants and energy production processes

end

- Memory: energy content, storage types, storage materials, cost
- Solar Air Conditioning: Cooling capacity determination, climate, solar cooling method and evaluation of air conditioning.

Workload
regular attendance: 21 h
self-study: 90 h

Literature

supply of lecture material in printed and electronic form

Stieglitz & Heinzel; Thermische Solarenergie -Grundlagen-Technologie- Anwendungen. Springer Vieweg Verlag. 711 Seiten. ISBN 978-3-642-29474-7

T 3.219 Course: Thermal Turbomachines I [T-MACH-105363]

Responsible: Prof. Dr.-Ing. Hans-Jörg Bauer
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	6	Each winter term	1

Events					
WS 18/19	2169453	Thermal Turbomachines I	3 SWS	Lecture / Practice (VÜ)	Bauer
WS 18/19	2169454	Tutorial - Thermal Turbo Machines I (Übungen zu Thermische Turbomaschinen I)	2 SWS	Practice (Ü)	Bauer
WS 18/19	2169553	Thermal Turbomachines I (in English)	3 SWS	Lecture / Practice (VÜ)	Bauer
Exams					
SS 2018	76-T-MACH-105363	Thermal Turbomachines I		Prüfung (PR)	Bauer
WS 18/19	76-T-MACH-105363	Thermal Turbomachines I		Prüfung (PR)	Bauer

Competence Certificate
oral exam, duration 30 min.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Thermal Turbomachines I
2169453, WS 18/19, 3 SWS, Open in study portal

Lecture / Practice (VÜ)

Learning Content
Basic concepts of thermal turbomachinery

Steam Turbines - Thermodynamic process analysis

Gas Turbines - Thermodynamic process analysis

Combined cycle and cogeneration processes

Overview of turbomachinery theory and kinematics

Energy transfer process within a turbine stage

Types of turbines (presented through examples)

1-D streamline analysis techniques

3-D flow fields and radial momentum equilibrium in turbines

Compressor stage analysis and future trends in turbomachinery

Workload
regular attendance: 31,50 h
self-study: 64,40 h

Literature
Lecture notes (available via Internet)

Bohl, W.: Strömungsmaschinen, Bd. I, II; Vogel Verlag, 1990, 1991

Sigloch, H.: Strömungsmaschinen, Carl Hanser Verlag, 1993

Traupel, W.: Thermische Turbomaschinen Bd. I, II, Springer-Verlag, 1977, 1982

V Thermal Turbomachines I (in English)

2169553, WS 18/19, 3 SWS, Open in study portal

Lecture / Practice (VÜ)

Learning Content
Basic concepts of thermal turbomachinery

Steam Turbines - Thermodynamic process analysis

Gas Turbines - Thermodynamic process analysis

Combined cycle and cogeneration processes

Overview of turbomachinery theory and kinematics

Energy transfer process within a turbine stage

Types of turbines (presented through examples)

1-D streamline analysis techniques

3-D flow fields and radial momentum equilibrium in turbines

Compressor stage analysis and future trends in turbomachinery

Workload
regular attendance: 31,50 h
self-study: 64,40 h

Literature
Lecture notes (available via Internet)

Bohl, W.: Strömungsmaschinen, Bd. I, II; Vogel Verlag, 1990, 1991

Sigloch, H.: Strömungsmaschinen, Carl Hanser Verlag, 1993

Traupel, W.: Thermische Turbomaschinen Bd. I, II, Springer-Verlag, 1977, 1982

T 3.220 Course: Thermal Turbomachines II [T-MACH-105364]

Responsible: Prof. Dr.-Ing. Hans-Jörg Bauer
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	6	Each summer term	2

Events					
SS 2018	2170476	Thermal Turbomachines II	3 SWS	Lecture (V)	Bauer
SS 2018	2170477	Tutorial - Thermal Turbomachines II (Übung - Thermische Turbomaschinen II)	2 SWS	Practice (Ü)	Bauer, Mitarbeiter
SS 2018	2170553	Thermal Turbomachines II (in English)	3 SWS	Lecture / Practice (VÜ)	Bauer
Exams					
SS 2018	76-T-MACH-105364	Thermal Turbomachines II		Prüfung (PR)	Bauer
WS 18/19	76-T-MACH-105364	Thermal Turbomachines II		Prüfung (PR)	Bauer

Competence Certificate
oral exam, duration: 30 min.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Thermal Turbomachines II — Lecture (V)
2170476, SS 2018, 3 SWS, Open in study portal

Learning Content
General overview, trends in design and development

Comparison turbine - compressor

Integrating resume of losses

Principal equations and correlations in turbine and compressor design, stage performance

Off-design performance of multi-stage turbomachines

Control system considerations for steam and gas turbines

Components of turbomachines

Critical components

Materials for turbine blades

Cooling methods for turbine blades (steam and air cooling methods)

Short overview of power plant operation

Combustion chamber and environmental issues

Workload
regular attendance: 31,50 h
self-study: 64,40 h

Literature
Lecture notes (Available via internet)
Bohl, W.: Strömungsmaschinen, Bd. I,II, Vogel Verlag 1990, 1991
Sigloch, H.: Strömungsmaschinen, Carl Hanser Verlag, 1993
Traupel, W.: Thermische Turbomaschinen, Bd. I,II, Springer-Verlag, 1977, 1982

V **Thermal Turbomachines II (in English)**
2170553, SS 2018, 3 SWS, Open in study portal
Lecture / Practice (VÜ)

Learning Content
Basic concepts of thermal turbomachinery

Steam Turbines - Thermodynamic process analysis

Gas Turbines - Thermodynamic process analysis

Combined cycle and cogeneration processes

Overview of turbomachinery theory and kinematics

Energy transfer process within a turbine stage

Types of turbines (presented through examples)

1-D streamline analysis techniques

3-D flow fields and radial momentum equilibrium in turbines

Compressor stage analysis and future trends in turbomachinery

Workload
regular attendance: 31,50 h
self-study: 64,40 h

Literature
Lecture notes (available via Internet)

Bohl, W.: Strömungsmaschinen, Bd. I, II; Vogel Verlag, 1990, 1991

Sigloch, H.: Strömungsmaschinen, Carl Hanser Verlag, 1993

Traupel, W.: Thermische Turbomaschinen Bd. I, II, Springer-Verlag, 1977, 1982

T 3.221 Course: Tires and Wheel Development for Passenger Cars [T-MACH-102207]

Responsible: Dr.-Ing. Günter Leister
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2114845	Tires and Wheel Development for Passenger Cars	2 SWS	Lecture (V)	Leister
Exams					
SS 2018	76-T-MACH-102207	Tires and Wheel Development for Passenger Cars		Prüfung (PR)	Leister
WS 18/19	76-T-MACH-102207	Tires and Wheel Development for Passenger Cars		Prüfung (PR)	Leister

Competence Certificate
Oral Examination

Duration: 30 up to 40 minutes

Auxiliary means: none

Prerequisites
none

Below you will find excerpts from events related to this course:

V Tires and Wheel Development for Passenger Cars
2114845, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content

1. The role of the tires and wheels in a vehicle
2. Geometrie of Wheel and tire, Package, load capacity and endurance, Book of requirement
3. Mobility strategy, Minispare, runflat systems and repair kit.
4. Project management: Costs, weight, planning, documentation
5. Tire testing and tire properties
6. Wheel technology incuding Design and manifacturing methods, Wheeltesting
7. Tire presssure: Indirect and direct measuring systems
8. Tire testing subjective and objective

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature
Manuscript to the lecture

T 3.222 Course: Tribology [T-MACH-105531]

Responsible: Prof. Dr. Martin Dienwiebel
Prof. Dr.-Ing. Matthias Scherge

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102812 - Schwerpunkt: Antriebssysteme

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	8	Each winter term	2

Events					
WS 18/19	2181114	Tribology	5 SWS	Lecture / Practice (VÜ)	Dienwiebel, Scherge
Exams					
SS 2018	76-T-MACH-105531	Tribology		Prüfung (PR)	Dienwiebel
WS 18/19	76-T-MACH-105531	Tribology		Prüfung (PR)	Dienwiebel

Competence Certificate
oral examination (ca. 40 min)

no tools or reference materials

Prerequisites
admission to the exam only with successful completion of the exercises [T-MACH-109303]

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-109303 - Exercices - Tribology must have been passed.

Recommendation
preliminary knowlegde in mathematics, mechanics and materials science

Below you will find excerpts from events related to this course:

V Tribology
2181114, WS 18/19, 5 SWS, Open in study portal

Lecture / Practice (VÜ)

Learning Content

- Chapter 1: Friction
  adhesion, geometrical and real area of contact, Friction experiments, friction powder, tribological stressing, evironmental influences, tribological age, contact models, Simulation of contacts, roughness.
- Chapter 2: Wear
  plastic deformation at the asperity level, dissipation modes, mechanical mixing, Dynamics of the third body, running-in, running- in dynamics, shear stress.
- Chapter 3: Lubrication
  base oils, Stribeck plot, lubrication regimes (HD, EHD, mixed lubrication), additives, oil characterization, solid lubrication.
- Chapter 4: Measurement Techniques
  friction measurement, tribometer, dissipated frictional power, conventional wear measurement, continuous wear measurement(RNT)
- Chapter 5: Roughness
  profilometry, surface roughness parameters, evaluation length and filters, bearing ratio curve, measurement error
- Chapter 6: Accompanying Analysis
  multi-scale topography measurement, chemical surface analysis, structural analysis, mechanical analysis

Exercises are used for complementing and deepening the contents of the lecture as well as for answering more extensive questions raised by the students.

Workload
regular attendance: 45 hours
self-study: 195 hours

Literature

1. Fleischer, G. ; Gröger, H. ; Thum: Verschleiß und Zuverlässigkeit. 1. Auflage. Berlin : VEB-Verlag Technik, 1980
2. Persson, B.J.N.: Sliding Friction, Springer Verlag Berlin, 1998
3. M. Dienwiebel, and M. Scherge, Nanotribology in automotive industry, In:Fundamentals of Friction and Wear on the Nanoscale; Editors: E. Meyer and E. Gnecco, Springer, Berlin, 2007.
4. Scherge, M., Shakhvorostov, D., Pöhlmann, K.: Fundamental wear mechanism of metals. Wear 255, 395–400 (2003)
5. Shakhvorostov, D., Pöhlmann, K., Scherge, M.: An energetic approach to friction, wear and temperature. Wear 257, 124–130 (2004)

T 3.223 Course: Turbo Jet Engines [T-MACH-105366]

Responsible: Prof. Dr.-Ing. Hans-Jörg Bauer
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2170478	Turbo Jet Engines	2 SWS	Lecture (V)	Bauer, Schulz
Exams					
SS 2018	76-T-MACH-105366	Turbo Jet Engines		Prüfung (PR)	Bauer, Schulz
WS 18/19	76-T-MACH-105366	Turbo Jet Engines		Prüfung (PR)	Bauer, Schulz

Competence Certificate
oral exam, duration: 20 min.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Turbo Jet Engines
2170478, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Introduction to jet engines and their components

Demands on engines and propulsive efficiency

Thermodynamic and gas dynamic fundamentals and design calculations

Components of air breathing engines

Jet engine design and development process

Engine and component design

Current developments in the jet engines industry

Workload
regular attendance:21 h
self-study: 42 h

Literature
Hagen, H.: Fluggasturbinen und ihre Leistungen, G. Braun Verlag, 1982
Hünnecke, K.: Flugtriebwerke, ihre Technik und Funktion, Motorbuch Verlag, 1993
Saravanamuttoo, H.; Rogers, G.; Cohen, H.: Gas Turbine Theory, 5th Ed., 04/2001
Rolls-Royce: The Jet Engine, ISBN:0902121235, 2005

T 3.224 Course: Tutorial Advanced Mathematics I [T-MATH-100525]

Responsible: PD Dr. Tilo Arens
Prof. Dr. Roland Griesmaier
PD Dr. Frank Hettlich

Organisation: KIT Department of Mathematics

Part of: M-MATH-102859 - Höhere Mathematik

Type	Credits	Recurrence	Version
Studienleistung schriftlich	0	Each winter term	2

Events					
WS 18/19	0131100	Übungen zu 0131000	2 SWS	Practice (Ü)	Hettlich
WS 18/19	0131300	Übungen zu 0131200	2 SWS	Practice (Ü)	Hettlich
Exams					
WS 18/19	6700005	Problem Class for Advanced Mathematics I		Prüfung (PR)	Arens, Hettlich, Kirsch

Competence Certificate
Learning assessment is carried out by written assigments (pre-requesite). Exact requirements will be communicated in the lectures.

Prerequisites
None.

T 3.225 Course: Tutorial Advanced Mathematics II [T-MATH-100526]

Responsible: PD Dr. Tilo Arens
Prof. Dr. Roland Griesmaier
PD Dr. Frank Hettlich

Organisation: KIT Department of Mathematics

Part of: M-MATH-102859 - Höhere Mathematik

Type	Credits	Recurrence	Version
Studienleistung schriftlich	0	Each summer term	2

Events					
SS 2018	0120020	Advanced Mathematics II (Problem Session)	2 SWS	Practice (Ü)	Thäter
SS 2018	0180900	Übungen zu 0180800	2 SWS	Practice (Ü)	Arens
SS 2018	0181100	Übungen zu 0181000	2 SWS	Practice (Ü)	Arens
Exams					
SS 2018	7700024	Problem Class for Advanced Mathematics II		Prüfung (PR)	Hettlich, Kirsch, Arens

Competence Certificate
Learning assessment is carried out by written assigments (pre-requesite). Exact requirements will be communicated in the lectures.

Prerequisites
None.

T 3.226 Course: Tutorial Advanced Mathematics III [T-MATH-100527]

Responsible: PD Dr. Tilo Arens
Prof. Dr. Roland Griesmaier
PD Dr. Frank Hettlich

Organisation: KIT Department of Mathematics

Part of: M-MATH-102859 - Höhere Mathematik

Type	Credits	Recurrence	Version
Studienleistung schriftlich	0	Each winter term	2

Events					
WS 18/19	0131500	Übungen zu 0131400	2 SWS	Practice (Ü)	Kirsch
Exams					
WS 18/19	6700006	Tutorial Advanced Mathematics III		Prüfung (PR)	Arens, Kirsch, Hettlich

Competence Certificate
Learning assessment is carried out by written assigments (pre-requesite). Exact requirements will be communicated in the lectures.

Prerequisites
None.

T 3.227 Course: Tutorial Engineering Mechanics I [T-MACH-100528]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Dr.-Ing. Tom-Alexander Langhoff

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102572 - Technische Mechanik

Type	Credits	Recurrence	Version
Studienleistung	0	Each winter term	2

Events					
WS 18/19	2161246	Tutorial Engineering Mechanics I	2 SWS	Practice (Ü)	Görthofer, Prahs, Böhlke
WS 18/19	3161011	Engineering Mechanics I (Tutorial)	2 SWS	Practice (Ü)	Pallicity, Langhoff
Exams					
SS 2018	76-T-MACH-100528	Tutorial Engineering Mechanics I		Prüfung (PR)	Böhlke, Langhoff
WS 18/19	76-T-MACH-100528	Tutorial Engineering Mechanics I		Prüfung (PR)	Böhlke, Langhoff
WS 18/19	76-T-MACH-100528-englisch	Tutorial Engineering Mechanics I		Prüfung (PR)	Böhlke, Langhoff

Competence Certificate

Attestations have to be achieved in the following four categories: mandatory written homework problems, written homework problems, computational homework problems, colloquia.

This course is passed if all mandatory written homework problems are passed and if in the other three categories (written homework problems, computational homework problems, colloquia) in total at most three attestations have been finally not passed, at most one in each of the three categories.

Succesful participation in this course allows for registration to the Exam "Engineering Mechanics I" (see T-MACH-100282)

Prerequisites

None

Below you will find excerpts from events related to this course:

V Tutorial Engineering Mechanics I

Practice (Ü)

2161246, WS 18/19, 2 SWS, Open in study portal

Learning Content

see lecture Engineering Mechanics I

Workload

time of attendance: 21h; self-study: 49h

Literature

see lecture Engineering Mechanics I

T 3.228 Course: Tutorial Engineering Mechanics II [T-MACH-100284]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Dr.-Ing. Tom-Alexander Langhoff

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102572 - Technische Mechanik

Type	Credits	Recurrence	Version
Studienleistung schriftlich	0	Each summer term	2

Events					
SS 2018	2162251	Tutorial Engineering Mechanics II	2 SWS	Practice (Ü)	Prahs, Görthofer, Böhlke
SS 2018	3162011	Engineering Mechanics II (Tutorial)	2 SWS	Practice (Ü)	Pallicity, Langhoff
Exams					
SS 2018	76-T-MACH-100284	Tutorial Engineering Mechanics II		Prüfung (PR)	Langhoff, Böhlke
WS 18/19	76-T-MACH-100284	Tutorial Engineering Mechanics II		Prüfung (PR)	Böhlke, Langhoff
WS 18/19	76-T-MACH-100284-englisch	Tutorial Engineering Mechanics II		Prüfung (PR)	Böhlke, Langhoff

Competence Certificate
Attestations have to be achieved in the following four categories: mandatory written homework problems, written homework problems, computational homework problems, colloquia.

This course is passed if all mandatory written homework problems are passed and if in the other three categories (written homework problems, computational homework problems, colloquia) in total at most two attestations have been finally not passed, at most one in each of the three categories.

Succesful participation in this course allows for registration to the Exam "Engineering Mechanics II" (see T-MACH-100283)

Prerequisites
None

Below you will find excerpts from events related to this course:

V Tutorial Engineering Mechanics II
2162251, SS 2018, 2 SWS, Open in study portal

Practice (Ü)

Learning Content
see lecture Engineering Mechanics II

Workload
time of attendance: 21h; self-study: 49h

Literature
see lecture Engineering Mechanics II

T 3.229 Course: Tutorial Engineering Mechanics III [T-MACH-105202]

Responsible: Prof. Dr.-Ing. Wolfgang Seemann
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102572 - Technische Mechanik

Type	Credits	Recurrence	Version
Studienleistung schriftlich	0	Each winter term	2

Events					
WS 18/19	2161204	Engineering Mechanics III (Tutorial)	2 SWS	Practice (Ü)	Seemann, Becker, Yüzbasioglu
WS 18/19	3161013	Engineering Mechanics III (Tutorial)	2 SWS	Practice (Ü)	Seemann, Becker, Yüzbasioglu
Exams					
SS 2018	76-T-MACH-105202	Tutorial Engineering Mechanics III		Prüfung (PR)	Seemann
WS 18/19	76-T-MACH-105202	Tutorial Engineering Mechanics III		Prüfung (PR)	Seemann

Competence Certificate
Attestations, succesful accomplishment of exercise sheets

Prerequisites
None

Below you will find excerpts from events related to this course:

V Engineering Mechanics III (Tutorial)

2161204, WS 18/19, 2 SWS, Open in study portal

Practice (Ü)

Learning Content
In the Tutorial excercises for the corresponding subjects of the lecture are presented. During the tutorial part of the tutorial excercises are presented and instructions for those excercises are given which have to be done as homework.

The homework is mandatory and is corrected by the tutors. A successful elaboration of the homework is necessary to take part in the final exam.

Workload
time of attendance: 21h; self-study: 39h

Literature
Hibbeler: Technische Mechanik 3, Dynamik, München, 2006

Gross, Hauger, Schnell: Technische Mechanik Bd. 3, Heidelberg, 1983

Lehmann: Elemente der Mechanik III, Kinetik, Braunschweig, 1975

Göldner, Holzweissig: Leitfaden der Technischen Mechanik.

Hagedorn: Technische Mechanik III.

T 3.230 Course: Tutorial Engineering Mechanics IV [T-MACH-105203]

Responsible: Prof. Dr.-Ing. Wolfgang Seemann
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102572 - Technische Mechanik

Type	Credits	Recurrence	Version
Studienleistung schriftlich	0	Each summer term	1

Events					
SS 2018	2162232	Engineering Mechanics IV (Tutorial)	2 SWS	Practice (Ü)	Seemann, Kapelke, Schröders
SS 2018	3162013	Engineering Mechanics 4 (Tutorial)	2 SWS	Practice (Ü)	Seemann, Kapelke, Schröders
Exams					
SS 2018	76-T-MACH-105203	Tutorial Engineering Mechanics IV		Prüfung (PR)	Seemann
WS 18/19	76-T-MACH-105203	Tutorial Engineering Mechanics IV		Prüfung (PR)	Seemann

Competence Certificate
Attestations, succesful accomplishment of exercise sheets

Below you will find excerpts from events related to this course:

V Engineering Mechanics IV (Tutorial)
2162232, SS 2018, 2 SWS, Open in study portal

Practice (Ü)

Learning Content
In the Tutorial excercises for the corresponding subjects of the lecture are presented. During the tutorial part of the excercises are presented and instructions are given for those excercises which have to be done as homework.

The homework is mandatory and is corrected by the tutors. A successful elaboration of the homework is necessary to take part in the final exam.

Workload
time of attendance: 21h; self-study: 39h

Literature
Hibbeler: Technische Mechanik 3, Dynamik, München, 2006
Marguerre: Technische Mechanik III, Heidelberger Taschenbücher, 1968
Magnus: Kreisel, Theorie und Anwendung, Springer-Verlag, Berlin,
1971 Klotter: Technische Schwingungslehre, 1. Bd. Teil A, Heidelberg

T 3.231 Course: Tutorial Mathematical Methods in Strength of Materials [T-MACH-106830]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102582 - Schwerpunkt: Kontinuumsmechanik
M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Studienleistung	0	Each winter term	2

Events					
WS 18/19	2161255	Übungen zu Mathematische Methoden der Festigkeitslehre	2 SWS	Practice (Ü)	Wicht, Böhlke
Exams					
WS 18/19	76-T-MACH-106830	Tutorial Mathematical Methods in Strength of Materials		Prüfung (PR)	Böhlke

Competence Certificate
successfully solving the homework sheets. Details are announced in the first lecture.

Passing this course allows registration to the exam "Mathematical Methods in Strength of Materials" (Teilleistung T-MACH-100297)

Prerequisites
None

T 3.232 Course: Value stream within enterprises – The value chain at Bosch [T-MACH-106375]

Responsible: Dr. Rudolf Maier
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102576 - Schlüsselqualifikationen

Type	Credits	Recurrence	Version
Studienleistung	2	Each winter term	1

Events					
WS 18/19	2149661	Der Wertstrom im Industrieunternehmen - Am Beispiel der Wertschöpfungskette bei Bosch	2 SWS	Seminar (S)	Maier
Exams					
WS 18/19	76-T-MACH-106375	Value stream within enterprises – The value chain at Bosch		Prüfung (PR)	Maier

Competence Certificate
alternative achievement (ungraded):
- attendance on at least 12 lecture units

Prerequisites
none

Below you will find excerpts from events related to this course:

V Der Wertstrom im Industrieunternehmen - Am Beispiel der Wertschöpfungskette bei Bosch

Seminar (S)

2149661, WS 18/19, 2 SWS, Open in study portal

Description
Lecture notes will be provided in Ilias
(https://ilias.studium.kit.edu/)

Notes
The registration for the seminar is via Ilias. (https://ilias.studium.kit.edu/)
The password will be announced in the first appointment.

Learning Content
The seminar provides an insight into the main functional units of a company and their typical processes by using Bosch as an example. Furthermore it is based on discussions with the students. Former Bosch top managers explain the essential business processes and functions of the individual departments as well as the classic tasks of an engineer in a worldwide operating automotive supplier. The seminar also provides an insight into the careers of the Bosch directors. In addition to the company processes, the seminar will therefore focus on reports of challenges, successes, failures and product and process innovations.
The topics are as follows:

- Introduction, strategy, innovation
- R&D, product development process
- Production
- Quality management
- Market, marketing, sales
- Aftermarket, service
- Finance, controlling
- Logistics
- Purchasing, supply chain
- IT
- HR, leadership, compliance

Workload
regular attendance: 21 hours
self-study: 39 hours

T 3.233 Course: Vehicle Comfort and Acoustics I [T-MACH-105154]

Responsible: Prof. Dr. Frank Gauterin
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-104442 - Schwerpunkt: Schwingungslehre

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
SS 2018	2114856	Vehicle Ride Comfort & Acoustics I	2 SWS	Lecture (V)	Gauterin
WS 18/19	2113806	Vehicle Comfort and Acoustics I	2 SWS	Lecture (V)	Gauterin
Exams					
SS 2018	76-T-MACH-105154	Vehicle Comfort and Acoustics I		Prüfung (PR)	Gauterin
WS 18/19	76-T-MACH-105154	Vehicle Comfort and Acoustics I		Prüfung (PR)	Gauterin

Competence Certificate
Oral Examination

Duration: 30 up to 40 minutes

Auxiliary means: none

Prerequisites
Can not be combined with lecture T-MACH-102206

Below you will find excerpts from events related to this course:

V Vehicle Ride Comfort & Acoustics I

2114856, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. Perception of noise and vibrations

3. Fundamentals of acoustics and vibrations

3. Tools and methods for measurement, computing, simulation and analysis of noise and vibrations

4. The relevance of tire and chasis for the acoustic and mechanical driving comfort:
phenomena, influencing parameters, types of construction, optimization of components and systems, conflict of goals, methods of development

An excursion will give insights in the development practice of a car manufacturer or a system supplier.

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature
1. Michael Möser, Technische Akustik, Springer, Berlin, 2005

2. Russel C. Hibbeler, Technische Mechanik 3, Dynamik, Pearson Studium, München, 2006

3. Manfred Mitschke, Dynamik der Kraftfahrzeuge, Band B: Schwingungen, Springer, Berlin, 1997

The script will be supplied in the lectures

V Vehicle Comfort and Acoustics I

2113806, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. Perception of noise and vibrations

3. Fundamentals of acoustics and vibrations

3. Tools and methods for measurement, computing, simulation and analysis of noise and vibrations

4. The relevance of tire and chasis for the acoustic and mechanical driving comfort:
phenomena, influencing parameters, types of construction, optimization of components and systems, conflict of goals, methods of development

An excursion will give insights in the development practice of a car manufacturer or a system supplier.

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature
1. Michael Möser, Technische Akustik, Springer, Berlin, 2005

2. Russel C. Hibbeler, Technische Mechanik 3, Dynamik, Pearson Studium, München, 2006

3. Manfred Mitschke, Dynamik der Kraftfahrzeuge, Band B: Schwingungen, Springer, Berlin, 1997

The script will be supplied in the lectures

T 3.234 Course: Vehicle Comfort and Acoustics II [T-MACH-105155]

Responsible: Prof. Dr. Frank Gauterin
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik
M-MACH-104442 - Schwerpunkt: Schwingungslehre

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	2114825	Vehicle Comfort and Acoustics II	2 SWS	Lecture (V)	Gauterin
SS 2018	2114857	Vehicle Ride Comfort & Acoustics II	2 SWS	Lecture (V)	Gauterin
Exams					
SS 2018	76-T-MACH-105155	Vehicle Comfort and Acoustics II		Prüfung (PR)	Gauterin
WS 18/19	76-T-MACH-105155	Vehicle Comfort and Acoustics II		Prüfung (PR)	Gauterin

Competence Certificate
Oral Examination

Duration: 30 up to 40 minutes

Auxiliary means: none

Prerequisites
Can not be combined with lecture T-MACH-102205

Below you will find excerpts from events related to this course:

V Vehicle Comfort and Acoustics II

2114825, SS 2018, 2 SWS, Open in study portal **Lecture (V)**

Learning Content
1. Summary of the fundamentals of acoustics and vibrations

2. The relevance of road surface, wheel imperfections, springs, dampers, brakes, bearings and bushings, suspensions, engines and drive train for the acoustic and mechanical driving comfort:
- phenomena
- influencing parameters
- types of construction
- optimization of components and systems
- conflicts of goals
- methods of development

3. Noise emission of motor vehicles
- noise stress
- sound sources and influencing parameters
- legal restraints
- optimization of components and systems
- conflict of goals
- methods of development

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature
The script will be supplied in the lectures.

V **Vehicle Ride Comfort & Acoustics II** **Lecture (V)**
2114857, SS 2018, 2 SWS, Open in study portal

Notes
The lecture starts in June 2016. Exact date of beginning: see homepage of institute.

Learning Content
1. Summary of the fundamentals of acoustics and vibrations

2. The relevance of road surface, wheel imperfections, springs, dampers, brakes, bearings and bushings, suspensions, engines and drive train for the acoustic and mechanical driving comfort:
- phenomena
- influencing parameters
- types of construction
- optimization of components and systems
- conflicts of goals
- methods of development

3. Noise emission of motor vehicles
- noise stress
- sound sources and influencing parameters
- legal restraints
- optimization of components and systems
- conflict of goals
- methods of development

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature
The script will be supplied in the lectures.

T 3.235 Course: Vehicle Ergonomics [T-MACH-108374]

Responsible: Dr.-Ing. Tobias Heine
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102815 - Schwerpunkt: Entwicklung und Konstruktion
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	1

Events					
SS 2018	2110050	Vehicle Ergonomics	2 SWS	Seminar (S)	Heine
Exams					
WS 18/19	76-T-MACH-108374	Vehicle Ergonomics		Prüfung (PR)	

Competence Certificate
written exam, 60 minutes

Prerequisites
none

T 3.236 Course: Vehicle Lightweight Design - Strategies, Concepts, Materials [T-MACH-105237]

Responsible: Prof. Dr.-Ing. Frank Henning
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102638 - Schwerpunkt: Bahnsystemtechnik
M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	1

Events					
WS 18/19	2113102	Vehicle Lightweight design – Strategies, Concepts, Materials	2 SWS	Lecture (V)	Henning
Exams					
SS 2018	76-T-MACH-105237	Vehicle Lightweight Design - Strategies, Concepts, Materials		Prüfung (PR)	Henning
WS 18/19	76-T-MACH-105237	Vehicle Lightweight Design - Strategies, Concepts, Materials		Prüfung (PR)	Henning

Competence Certificate
Written exam, 90 minutes

Prerequisites
none

Recommendation
none

Below you will find excerpts from events related to this course:

V Vehicle Lightweight design – Strategies, Concepts, Materials

2113102, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
strategies in lightweight design
shape optimization, light weight materials, multi-materials and concepts for lightweight design

construction methods
differential, integral, sandwich, modular, bionic

body construction
shell, space frame, monocoque

metalic materials
steal, aluminium, magnesium, titan

Workload
lectures: 21h, preparation of examination: 79h

T 3.237 Course: Vehicle Mechatronics I [T-MACH-105156]

Responsible: Prof. Dr.-Ing. Dieter Ammon
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102818 - Schwerpunkt: Kraftfahrzeugtechnik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	1

Events					
WS 18/19	2113816	Vehicle Mechatronics I	2 SWS	Lecture (V)	Ammon
Exams					
SS 2018	76-T-MACH-105156	Vehicle Mechatronics I		Prüfung (PR)	Ammon
WS 18/19	76-T-MACH-105156	Vehicle Mechatronics I		Prüfung (PR)	Ammon

Competence Certificate
Written examination

Duration: 90 minutes

Auxiliary means: none

Prerequisites
none

Below you will find excerpts from events related to this course:

V Vehicle Mechatronics I

2113816, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
1. Introduction: Mechatronics in vehicle technology
2. Vehicle Control systems
Brake- and traction controls (ABS, ASR, automated power train controls)
Active and semiactive suspension systems, active stabilizor bars
Vehicle dynamics controls, driver assistence systems
3. Modelling technology
Mechanics - multi body dynamics
Electrical and electronical systems, control systems
Hydraulics
Interdisciplinary coupled systems
4. Computer simulation technology
Numerical integration methods
Quality (validation, operating areas, accuracy, performance)
Simulator-coupling (hardware-in-the-loop, software-in-the-loop)
5. Systemdesign (example: brake control)
Demands, requirements (funktion, safety, robustness)
Problem setup (analysis - modelling - model reduction)
Solution approaches
Evaluation (quality, efficiency, validation area, concept ripeness)

Workload
regular attendance: 22,5 hours
self-study: 97,5 hours

Literature

1. Ammon, D., Modellbildung und Systementwicklung in der Fahrzeugdynamik, Teubner, Stuttgart, 1997
2. Mitschke, M., Dynamik der Kraftfahrzeuge, Bände A-C, Springer, Berlin, 1984ff
3. Miu, D.K., Mechatronics - Electromechanics and Contromechanics, Springer, New York, 1992
4. Popp, K. u. Schiehlen, W., Fahrzeugdynamik - Eine Einführung in die Dynamik des Systems Fahrzeug-Fahrweg, Teubner, Stuttgart, 1993
5. Roddeck, W., Einführung in die Mechatronik, Teubner, Stuttgart, 1997
6. Zomotor, A., Fahrwerktechnik: Fahrverhalten, Vogel, Würzburg, 1987

T 3.238 Course: Vibration Theory [T-MACH-105290]

Responsible: Prof. Dr.-Ing. Alexander Fidlin
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul
M-MACH-104442 - Schwerpunkt: Schwingungslehre

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	5	Each winter term	2

Events					
WS 18/19	2161212	Vibration Theory	2 SWS	Lecture (V)	Fidlin
WS 18/19	2161213	Übungen zu Technische Schwingungslehre	2 SWS	Practice (Ü)	Fidlin, Leister
Exams					
SS 2018	76-T-MACH-105290	Vibration Theory		Prüfung (PR)	Fidlin
WS 18/19	76-T-MACH-105290	Vibration Theory		Prüfung (PR)	Fidlin

Competence Certificate
written exam, 180 min.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Vibration Theory

2161212, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
Concept of vibration, superposition of vibration with equal and with different frequencies, complex frequency response.

Vibration of systems with one dof: Free undamped and damped vibration, forced vibration for harmonic, periodic and arbitrary excitation. Excitation of undamped vibration in resonance.

Systems with many degrees of freedom: Eigenvalue problem for undamped vibration, orthogonality of eigenvectors, modal decoupling, approximation methods, eigenvalue problem for damped vibration. Forced vibration for harmonic excitation, modal decomposition for arbitrary forced vibration, vibration absorber.

Vibration of systems with distributed parameters: Partial differential equations as equations of motion, wave propagation, d'Alembert's solution, Ansatz for separation of time and space, eigenvalue problem, infinite number of eigenvalues and eigenfunctions.

Introduction to rotor dynamics: Laval rotor in rigid and elastic bearings, inner damping, Laval rotor in anisotropic bearings, synchronous and asynchronous whirl, rotors with asymmetric shaft.

Workload
time of attendance: 22,5 h; self-study: 128 h

Literature
Klotter: Technische Schwingungslehre, Bd. 1 Teil A, Heidelberg, 1978

Hagedorn, Otterbein: Technische Schwingungslehre, Bd 1 and Bd 2, Berlin, 1987

Wittenburg: Schwingungslehre, Springer-Verlag, Berlin, 1995

T 3.239 Course: Virtual Engineering (Specific Topics) [T-MACH-105381]

Responsible: Prof. Dr.-Ing. Jivka Ovtcharova
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102746 - Wahlpflichtmodul

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each summer term	1

Events					
SS 2018	3122031	Virtual Engineering (Specific Topics)	2 SWS	Lecture (V)	Ovtcharova, Mitarbeiter
Exams					
SS 2018	76-T-MACH-105381	Virtual Engineering (Specific Topics)		Prüfung (PR)	Ovtcharova
WS 18/19	76-T-MACH-105381	Virtual Engineering (Specific Topics)		Prüfung (PR)	Ovtcharova

Competence Certificate
oral exam, 20 min.

Prerequisites
none

T 3.240 Course: Virtual Reality Practical Course [T-MACH-102149]

Responsible: Prof. Dr.-Ing. Jivka Ovtcharova
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102583 - Schwerpunkt: Informationsmanagement
M-MACH-102820 - Schwerpunkt: Mechatronik

Type	Credits	Recurrence	Version
Prüfungsleistung anderer Art	4	Each term	2

Events					
WS 18/19	2123375	Virtual Reality Practical Course	3 SWS	Project (PRO)	Ovtcharova, Mitarbeiter
Exams					
SS 2018	76-T-MACH-102149	Virtual Reality Practical Course		Prüfung (PR)	Ovtcharova
WS 18/19	76-T-MACH-102149	Virtual Reality Practical Course		Prüfung (PR)	Ovtcharova

Competence Certificate
Assessment of another type (graded)

Prerequisites
None

Annotation
Number of participants is limited

Below you will find excerpts from events related to this course:

V Virtual Reality Practical Course

2123375, WS 18/19, 3 SWS, Open in study portal

Project (PRO)

Learning Content
The lab course consists of:

1. Introduction and basics in virtual reality (hardware, software, application)
2. Introduction in 3DVIA Virtools tool kit as an application development system
3. IMplermentation and practice by developing a driving simulator in small groups.

T 3.241 Course: Vortex Dynamics [T-MACH-105784]

Responsible: Dr. Jochen Kriegseis
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2153438	Vortex Dynamics	2 SWS	Lecture (V)	Kriegseis
Exams					
SS 2018	76-T-MACH-105784	Vortex Dynamics		Prüfung (PR)	Kriegseis
WS 18/19	7600006	Vortex Dynamics		Prüfung (PR)	Kriegseis
WS 18/19	76-T-MACH-105784	Vortex Dynamics		Prüfung (PR)	

Competence Certificate
oral exam - 30 minutes

Prerequisites
none

Below you will find excerpts from events related to this course:

V Vortex Dynamics

2153438, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content

- Definition of a vortex
- Theoretical description of vortex flow
- Steady and time-dependent solutions of vortex flows
- Helmholtz's vortex theorems
- Vorticity equation
- Properties of various vortical structures
- Introduction of various vortec identification approaches

Workload
regulare attendance: 20h
Self-study: 100h

Literature
Spurk, J.H.: Fluid Mechanics, Springer, 1996
Green, S.I.: Fluid Vortices, Kluwer Academic Publishers, 1995

Wu, J.-Z. et al.: Vorticity and Vortex Dynamics, Springer, 2006

Saffman, P.G.: Vortex Dynamics, Cambrigde University Press, 1992

T 3.242 Course: Warehousing and Distribution Systems [T-MACH-105174]

Responsible: Prof. Dr.-Ing. Kai Furmans
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102821 - Schwerpunkt: Technische Logistik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each summer term	1

Events					
SS 2018	2118097	Warehousing and distribution systems	2 SWS	Lecture (V)	Furmans
Exams					
SS 2018	76-T-MACH-105174	Warehousing and Distribution Systems		Prüfung (PR)	Furmans
WS 18/19	76-T-MACH-105174	Warehousing and Distribution Systems		Prüfung (PR)	Furmans, Mittwollen

Competence Certificate
The assessment consists of a 60 minutes written examination (according to §4(2), 1 of the examination regulation).

Prerequisites
none

Below you will find excerpts from events related to this course:

V Warehousing and distribution systems

2118097, SS 2018, 2 SWS, Open in study portal

Lecture (V)

Description
Media:

presentations, black board

Learning Content

- Introduction
- Yard management
- Receiving
- Storage and picking
- Workshop on cycle times
- Consoldiation and packing
- Shipping
- Added Value
- Overhead
- Case Study: DCRM
- Planning of warehouses
- Case study: Planning of warehouses
- Distribution networks
- Lean Warehousing

Annotation
none

Workload
regular attendance: 21 hours
self-study: 99 hours

Literature

ARNOLD, Dieter, FURMANS, Kai (2005)
Materialfluss in Logistiksystemen, 5. Auflage, Berlin: Springer-Verlag

ARNOLD, Dieter (Hrsg.) et al. (2008)
Handbuch Logistik, 3. Auflage, Berlin: Springer-Verlag

BARTHOLDI III, John J., HACKMAN, Steven T. (2008)
Warehouse Science

GUDEHUS, Timm (2005)
Logistik, 3. Auflage, Berlin: Springer-Verlag

FRAZELLE, Edward (2002)
World-class warehousing and material handling, McGraw-Hill

MARTIN, Heinrich (1999)
Praxiswissen Materialflußplanung: Transport, Hanshaben, Lagern, Kommissionieren, Braunschweig, Wiesbaden: Vieweg

WISSER, Jens (2009)
Der Prozess Lagern und Kommissionieren im Rahmen des Distribution Center Reference Model (DCRM); Karlsruhe : Universitätsverlag

A comprehensive overview of scientific papers can be found at:

ROODBERGEN, Kees Jan (2007)
Warehouse Literature

3.243 Course: Wave and Quantum Physics [T-PHYS-108322]

Responsible: Prof. Dr. Gernot Goll
Prof. Dr. Bernd Pilawa
Organisation: KIT Department of Physics
Part of: M-PHYS-104030 - Physik

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	5	Each summer term	1

Events					
SS 2018	4040411	Wellen und Quantenphysik	2 SWS	Lecture (V)	Pilawa
SS 2018	4040412	Übungen zu Wellen und Quantenphysik	1 SWS	Practice (Ü)	Pilawa, N.
SS 2018	4040431	Wave and Quantum Physics	2 SWS	Lecture (V)	Goll
SS 2018	4040432	Exercises to Wave and Quantum Physics	1 SWS	Practice (Ü)	Goll, Hervé
Exams					
SS 2018	7800123	Wellen und Quantenphysik (Exam in German)		Prüfung (PR)	
SS 2018	7800124	Wave and Quantum Physics (Exam in English)		Prüfung (PR)	Goll
WS 18/19	7800123	Wellen- und Quantenphysik (Exam in German)		Prüfung (PR)	Pilawa
WS 18/19	7800124	Wave and Quantum Physics (Exam in English)		Prüfung (PR)	Goll

Competence Certificate
Written exam (usually about 180 min)

Prerequisites
none

T 3.244 Course: Wave Propagation [T-MACH-105443]

Responsible: Prof. Dr.-Ing. Wolfgang Seemann
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104442 - Schwerpunkt: Schwingungslehre

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2161219	Wave Propagation	2 SWS	Lecture (V)	Seemann
Exams					
SS 2018	76-T-MACH-105443	Wave Propagation		Prüfung (PR)	Seemann
WS 18/19	76-T-MACH-105443	Wave Propagation		Prüfung (PR)	Seemann

Competence Certificate
oral exam, 30 min.

Prerequisites
T-MACH-105290 - Technische Schwingungslehre

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-105290 - Vibration Theory must have been passed.

T 3.245 Course: Welding Technology [T-MACH-105170]

Responsible: Dr. Majid Farajian
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102819 - Schwerpunkt: Materialwissenschaft und Werkstofftechnik

Type	Credits	Recurrence	Version
Prüfungsleistung mündlich	4	Each winter term	1

Events					
WS 18/19	2173571	Welding Technology	2 SWS	Lecture (V)	Farajian
Exams					
SS 2018	76-T-MACH-105170	Welding Technology		Prüfung (PR)	Farajian
WS 18/19	76-T-MACH-105170	Welding Technology		Prüfung (PR)	Farajian

Competence Certificate
Oral exam, about 20 minutes

Prerequisites
none

Recommendation
Basics of material science (iron- and non-iron alloys), materials, processes and production, design.

All the relevant books of the German Welding Institute (DVS: Deutscher Verband für Schweißen und verwandte Verfahren) in the field of welding and joining is recommended.

Below you will find excerpts from events related to this course:

V Welding Technology
2173571, WS 18/19, 2 SWS, Open in study portal

Lecture (V)

Learning Content
definition, application and differentiation: welding,

welding processes, alternative connecting technologies.

history of welding technology

sources of energy for welding processes

Survey: Fusion welding,

pressure welding.

weld seam preparation/design

welding positions

weldability

gas welding, thermal cutting, manual metal-arc welding

submerged arc welding

gas-shielded metal-arc welding, friction stir welding, laser beam and electron beam welding, other fusion and pressure welding processes

static and cyclic behavior of welded joints,

fatigue life improvement techniques

Workload
The workload for the lecture Welding Technology is 120 h per semester and consists of the presence during the lecture (18 h) as well as preparation and rework time at home (102 h).

Literature

Für ergänzende, vertiefende Studien gibt das

Handbuch der Schweißtechnik von J. Ruge, Springer Verlag Berlin, mit seinen vier Bänden

Band I: Werkstoffe

Band II: Verfahren und Fertigung

Band III: Konstruktive Gestaltung der Bauteile

Band IV: Berechnung der Verbindungen

einen umfassenden Überblick. Der Stoff der Vorlesung Schweißtechnik findet sich in den Bänden I und II. Einen kompakten Einblick in die Lichtbogenschweißverfahren bietet das Bändchen

Nies: Lichtbogenschweißtechnik, Bibliothek der Technik Band 57, Verlag moderne Industrie AG und Co., Landsberg / Lech

Im Übrigen sei auf die zahlreichen Fachbücher des DVS Verlages, Düsseldorf, zu allen Einzelgebieten der Fügetechnik verwiesen.

T 3.246 Course: Windpower [T-MACH-105234]

Responsible: Dr. Norbert Lewald
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik
M-MACH-102838 - Schwerpunkt: Kraft- und Arbeitsmaschinen

Type	Credits	Recurrence	Version
Prüfungsleistung schriftlich	4	Each winter term	2

Events					
WS 18/19	2157381	Windpower	2 SWS	Event (Veranst.)	Lewald, Pritz
Exams					
SS 2018	76-T-MACH-105234	Windpower		Prüfung (PR)	Gabi
WS 18/19	76-T-MACH-105234	Windpower		Prüfung (PR)	Gabi

Competence Certificate
written exam, 120 minutes

Prerequisites
none

Below you will find excerpts from events related to this course:

V Windpower

2157381, WS 18/19, 2 SWS, Open in study portal

Event (Veranst.)

Description
Media:

A scriptum that has to be overhault is available under www.ieh.kit.edu under “Studium und Lehre”. Further book titles or relevant websites will be announced in the lecture.

Learning Content
The lecture contacts due to the broadly basic knowledge to all listeners of all terms.

On the basis of an overview of alternative, renewable energy technologies as well as general energy data, the entrance is transacted into the wind energy by means of an overview of the historical development of the wind force.

Since the wind supplies the driving power as indirect solar energy, the global and the local wind systems as well as their measurement and energy content are dedicated to its own chapter.

Whereupon constructing the aerodynamic bases and connections of wind-power plants and/or their profiles are described. The electrical system of the wind-power plants forms a further emphasis. Begun of fundamental generator technology over control and controlling of the energy transfer.

After the emphasis aerodynamics and electrical system the further components of wind-power plants and their characteristics in the connection are described.

Finally the current economic, ecological and legislations boundary conditions for operating wind-power plants are examined.

In addition to wind-power plants for electricity production, the lecture is also shortly aiming at alternative use possibilities such as pumping systems.

Finally an overview of current developments like super-grids and visions of the future of the wind power utilization will be given.

T 3.247 Course: Working Methods in Mechanical Engineering [T-MACH-105296]

Responsible: Prof. Dr.-Ing. Barbara Deml
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102576 - Schlüsselqualifikationen

Type	Credits	Recurrence	Version
Studienleistung	4	Each summer term	1

Events					
SS 2018	2110969	Working Methods in Mechanical Engineering	1 SWS	Lecture (V)	Deml
SS 2018	2174970	Working Methods in Mechanical Engineering	1 SWS	Lecture (V)	Deml
Exams					
SS 2018	76-T-MACH-105296	Working Techniques for Mechanical Engineering		Prüfung (PR)	Deml
WS 18/19	76-T-MACH-105296	Working Techniques for Mechanical Engineering		Prüfung (PR)	Deml

Competence Certificate
Tests within the workshop sessions concerning the topics of the online-lecture as well as active participation during all four workshop sessions.

Prerequisites
none

Below you will find excerpts from events related to this course:

V Working Methods in Mechanical Engineering

2110969, SS 2018, 1 SWS, Open in study portal

Lecture (V)

Learning Content

1. Time- and self-management
2. Literature research
3. Team work
4. Scientific writing
5. Scientific presentation

Workload
The amount of work accounts for 60 h (=2 ECTS).

Literature
The script as well as further literature resources are available on ILIAS.

T 3.248 Course: Workshop on computer-based flow measurement techniques [T-MACH-106707]

Responsible: Prof. Dr.-Ing. Hans-Jörg Bauer
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102816 - Schwerpunkt: Grundlagen der Energietechnik

Type	Credits	Recurrence	Version
Studienleistung	4	Each term	1

Events					
SS 2018	2171488	Workshop on computer-based flow measurement techniques	3 SWS	Practical course (P)	Bauer, Mitarbeiter
WS 18/19	2171488	Workshop on computer-based flow measurement techniques	3 SWS	Practical course (P)	Bauer, Mitarbeiter
Exams					
WS 18/19	76-T-MACH-106707	Workshop on computer-based flow measurement techniques		Prüfung (PR)	Bauer

Competence Certificate
Group colloquia for each topic

Duration: approximately 10 minutes

no tools or reference materials may be used

Prerequisites
none

Below you will find excerpts from events related to this course:

V Workshop on computer-based flow measurement techniques

2171488, SS 2018, 3 SWS, Open in study portal

Practical course (P)

Learning Content
The laboratory course offers an introduction into the acquisition of basic test data in fluid mechanics applications as well as a basic hands-on training for the application of modern PC based data acquisition methods. The combination of lectures about measurement techniques, sensors, signal converters, I/O systems, bus systems, data acquisition, handling and control routines and tutorials for typical fluid mechanics applications allows the participant to get a comprehensive insight and a sound knowledge in this field. The graphical programming environment LabVIEW from National Instruments is used in this course as it is one of the standard software tools for data acquisition worldwide.

Basic design of measurements systems

- Logging devices and sensors
- Analog to digital conversion
- Program design and programming methods using LabView
- Data handling
- Bus systems
- Design of a computer aided data acquisition system for pressure, temperature and derived parameters
- frequency analysis

Annotation
Registration during the lecture period via the website.

Workload
regular attendance: 52,5
self-study: 67,5

Literature
Germer, H.; Wefers, N.: Meßelektronik, Bd. 1, 1985

LabView User Manual

Hoffmann, Jörg: Taschenbuch der Messtechnik, 6., aktualisierte. Aufl. , 2011

V **Workshop on computer-based flow measurement techniques**
2171488, WS 18/19, 3 SWS, Open in study portal

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Universität des Landes Baden-Württemberg und
nationales Forschungszentrum in der Helmholtz-Gemeinschaft

Amtliche Bekanntmachung

2015 **Ausgegeben Karlsruhe, den 06. August 2015** **Nr. 62**

I n h a l t **Seite**

Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Bachelorstudiengang Maschinenbau

vom 04. August 2015

Aufgrund von § 10 Absatz 2 Ziff. 5 und § 20 des Gesetzes über das Karlsruher Institut für Technologie (KIT-Gesetz - KITG) in der Fassung vom 14. Juli 2009 (GBl. S. 317 f), zuletzt geändert durch Artikel 5 des Dritten Gesetzes zur Änderung hochschulrechtlicher Vorschriften (3. Hochschulrechtsänderungsgesetz – 3. HRÄG) vom 01. April 2014 (GBl. S. 99, 167) und § 8 Absatz 5 des Gesetzes über die Hochschulen in Baden-Württemberg (Landeshochschulgesetz - LHG) in der Fassung vom 1. Januar 2005 (GBl. S. 1 f), zuletzt geändert durch Artikel 1 des 3. HRÄG vom 01. April 2014 (GBl. S. 99 ff.), hat der Senat des KIT am 20. Juli 2015 die folgende Studien- und Prüfungsordnung für den Bachelorstudiengang Maschinenbau beschlossen.

Der Präsident hat seine Zustimmung gemäß § 20 Absatz 2 KITG iVm. § 32 Absatz 3 Satz 1 LHG am 04. August 2015 erteilt.

Inhaltsverzeichnis

Präambel

Das KIT hat sich im Rahmen der Umsetzung des Bolognaprozesses zum Aufbau eines Europäischen Hochschulraumes zum Ziel gesetzt, dass am Abschluss des Studiums am KIT der Mastergrad stehen soll. Das KIT sieht daher die am KIT angebotenen konsekutiven Bachelor- und Masterstudiengänge als Gesamtkonzept mit konsekutivem Curriculum.

I. Allgemeine Bestimmungen

§ 1 Geltungsbereich

Diese Bachelorprüfungsordnung regelt Studienablauf, Prüfungen und den Abschluss des Studiums im Bachelorstudiengang Maschinenbau am KIT.

§ 2 Ziel des Studiums, Akademischer Grad

(1) Im Bachelorstudium sollen die wissenschaftlichen Grundlagen und die Methodenkompetenz der Fachwissenschaften vermittelt werden. Ziel des Studiums ist die Fähigkeit, einen konsekutiven Masterstudiengang erfolgreich absolvieren zu können sowie das erworbene Wissen berufsfeldbezogen anwenden zu können.

(2) Aufgrund der bestandenen Bachelorprüfung wird der akademische Grad „Bachelor of Science (B.Sc.)“ für den Bachelorstudiengang Maschinenbau verliehen.

§ 3 Regelstudienzeit, Studienaufbau, Leistungspunkte

(1) Der Studiengang nimmt teil am Programm „Studienmodelle individueller Geschwindigkeit“. Die Studierenden haben im Rahmen der dortigen Kapazitäten und Regelungen bis einschließlich drittem Fachsemester Zugang zu den Veranstaltungen des MINT-Kollegs Baden-Württemberg (im folgenden MINT-Kolleg).

(2) Die Regelstudienzeit beträgt sechs Semester. Bei einer qualifizierten Teilnahme am MINT-Kolleg bleiben bei der Anrechnung auf die Regelstudienzeit bis zu zwei Semester unberücksichtigt. Die konkrete Anzahl der Semester richtet sich nach § 8 Absatz 2 Satz 3 bis 5.

Eine qualifizierte Teilnahme liegt vor, wenn die Studierende Veranstaltungen des MINT- Kollegs für die Dauer von mindestens einem Semester im Umfang von mindestens zwei Fachkursen (Gesamtworkload 10 Semesterwochenstunden) belegt hat. Das MINT-Kolleg stellt hierüber eine Bescheinigung aus.

(3) Das Lehrangebot des Studiengangs ist in Fächer, die Fächer sind in Module, die jeweiligen Module in Lehrveranstaltungen gegliedert. Die Fächer und ihr Umfang werden in § 20 festgelegt. Näheres beschreibt das Modulhandbuch.

(4) Der für das Absolvieren von Lehrveranstaltungen und Modulen vorgesehene Arbeitsaufwand wird in Leistungspunkten (LP) ausgewiesen. Die Maßstäbe für die Zuordnung von Leistungspunkten entsprechen dem European Credit Transfer System (ECTS). Ein Leistungspunkt entspricht einem Arbeitsaufwand von etwa 30 Zeitstunden. Die Verteilung der Leistungspunkte auf die Semester hat in der Regel gleichmäßig zu erfolgen.

(5) Der Umfang der für den erfolgreichen Abschluss des Studiums erforderlichen Studien- und Prüfungsleistungen wird in Leistungspunkten gemessen und beträgt insgesamt 180 Leistungspunkte.

(6) Lehrveranstaltungen können nach vorheriger Ankündigung auch in englischer Sprache angeboten werden, sofern es deutschsprachige Wahlmöglichkeiten gibt.

§ 4 Modulprüfungen, Studien- und Prüfungsleistungen

(1) Die Bachelorprüfung besteht aus Modulprüfungen. Modulprüfungen bestehen aus einer oder mehreren Erfolgskontrollen.

Erfolgskontrollen gliedern sich in Studien- oder Prüfungsleistungen.

(2) Prüfungsleistungen sind:

1. schriftliche Prüfungen,
2. mündliche Prüfungen oder
3. Prüfungsleistungen anderer Art.

(3) Studienleistungen sind schriftliche, mündliche oder praktische Leistungen, die von den Studierenden in der Regel lehrveranstaltungsbegleitend erbracht werden. Die Bachelorprüfung darf nicht mit einer Studienleistung abgeschlossen werden.

(4) Von den Modulprüfungen sollen mindestens 70 % benotet sein.

(5) Bei sich ergänzenden Inhalten können die Modulprüfungen mehrerer Module durch eine auch modulübergreifende Prüfungsleistung (Absatz 2 Nr.1 bis 3) ersetzt werden.

§ 5 Anmeldung und Zulassung zu den Modulprüfungen und Lehrveranstaltungen

(1) Um an den Modulprüfungen teilnehmen zu können, müssen sich die Studierenden online im Studierendenportal zu den jeweiligen Erfolgskontrollen anmelden. In Ausnahmefällen kann eine Anmeldung schriftlich im Studierendenservice oder in einer anderen, vom Studierendenservice autorisierten Einrichtung erfolgen. Für die Erfolgskontrollen können durch die Prüfenden Anmeldefristen festgelegt werden. Die Anmeldung der Bachelorarbeit ist im Modulhandbuch geregelt.

(2) Sofern Wahlmöglichkeiten bestehen, müssen Studierende, um zu einer Prüfung in einem bestimmten Modul zugelassen zu werden, vor der ersten Prüfung in diesem Modul mit der Anmeldung zu der Prüfung eine bindende Erklärung über die Wahl des betreffenden Moduls und dessen Zuordnung zu einem Fach abgeben. Auf Antrag des/der Studierenden an den Prüfungsausschuss kann die Wahl oder die Zuordnung nachträglich geändert werden. Sofern bereits ein Prüfungsverfahren in einem Modul begonnen wurde, ist die Änderung der Wahl oder der Zuordnung erst nach Beendigung des Prüfungsverfahrens zulässig; dies gilt nur für Prüfungsleistungen.

(3) Zu einer Erfolgskontrolle ist zuzulassen, wer

1. in den Bachelorstudiengang Maschinenbau am KIT eingeschrieben ist; die Zulassung beurlaubter Studierender ist auf Prüfungsleistungen beschränkt; und

2. nachweist, dass er die im Modulhandbuch für die Zulassung zu einer Erfolgskontrolle festgelegten Voraussetzungen erfüllt und

3. nachweist, dass er in dem Bachelorstudiengang Maschinenbau den Prüfungsanspruch nicht verloren hat.

(4) Nach Maßgabe von § 30 Abs. 5 LHG kann die Zulassung zu einzelnen Pflichtveranstaltungen beschränkt werden. Der/die Prüfende entscheidet über die Auswahl unter den Studierenden, die sich rechtzeitig bis zu dem von dem/der Prüfenden festgesetzten Termin angemeldet haben unter Berücksichtigung des Studienfortschritts dieser Studierenden und unter Beachtung von § 13 Abs. 1 Satz 1 und 2, sofern ein Abbau des Überhangs durch andere oder zusätzliche Veranstaltungen nicht möglich ist. Für den Fall gleichen Studienfortschritts sind durch die KIT-Fakultäten weitere Kriterien festzulegen. Das Ergebnis wird den Studierenden rechtzeitig bekannt gegeben.

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(5) Die Zulassung ist abzulehnen, wenn die in Absatz 3 und 4 genannten Voraussetzungen nicht erfüllt sind.

§ 6 Durchführung von Erfolgskontrollen

(1) Erfolgskontrollen werden studienbegleitend, in der Regel im Verlauf der Vermittlung der Lehrinhalte der einzelnen Module oder zeitnah danach, durchgeführt.

(2) Die Art der Erfolgskontrolle (§ 4 Abs. 2 Nr. 1 bis 3, Abs. 3) wird von der/dem Prüfenden der betreffenden Lehrveranstaltung in Bezug auf die Lerninhalte der Lehrveranstaltung und die Lernziele des Moduls festgelegt. Die Art der Erfolgskontrolle, ihre Häufigkeit, Reihenfolge und Gewichtung sowie gegebenenfalls die Bildung der Modulnote müssen mindestens sechs Wochen vor Vorlesungsbeginn im Modulhandbuch bekannt gemacht werden. Im Einvernehmen von Prüfendem und Studierender bzw. Studierendem können die Art der Prüfungsleistung sowie die Prüfungssprache auch nachträglich geändert werden; im ersten Fall ist jedoch § 4 Abs. 5 zu berücksichtigen. Bei der Prüfungsorganisation sind die Belange Studierender mit Behinderung oder chronischer Erkrankung gemäß § 13 Abs. 1 zu berücksichtigen. § 13 Abs. 1 Satz 3 und 4 gelten entsprechend.

(3) Bei unvertretbar hohem Prüfungsaufwand kann eine schriftlich durchzuführende Prüfungsleistung auch mündlich, oder eine mündlich durchzuführende Prüfungsleistung auch schriftlich abgenommen werden. Diese Änderung muss mindestens sechs Wochen vor der Prüfungsleistung bekannt gegeben werden.

(4) Bei Lehrveranstaltungen in englischer Sprache (§ 3 Abs. 6) können die entsprechenden Erfolgskontrollen in dieser Sprache abgenommen werden. § 6 Abs. 2 gilt entsprechend.

(5) *Schriftliche Prüfungen* (§ 4 Abs. 2 Nr. 1) sind in der Regel von einer/einem Prüfenden nach § 18 Abs. 2 oder 3 zu bewerten. Sofern eine Bewertung durch mehrere Prüfende erfolgt, ergibt sich die Note aus dem arithmetischen Mittel der Einzelbewertungen. Entspricht das arithmetische Mittel keiner der in § 7 Abs. 2 Satz 2 definierten Notenstufen, so ist auf die nächstliegende Notenstufe auf- oder abzurunden. Bei gleichem Abstand ist auf die nächstbessere Notenstufe zu runden. Das Bewertungsverfahren soll sechs Wochen nicht überschreiten. Schriftliche Prüfungen dauern mindestens 60 und höchstens 300 Minuten.

(6) *Mündliche Prüfungen* (§ 4 Abs. 2 Nr. 2) sind von mehreren Prüfenden (Kollegialprüfung) oder von einer/m Prüfenden in Gegenwart einer oder eines Beisitzenden als Gruppen- oder Einzelprüfungen abzunehmen und zu bewerten. Vor der Festsetzung der Note hört die/der Prüfende die anderen an der Kollegialprüfung mitwirkenden Prüfenden an. Mündliche Prüfungen dauern in der Regel mindestens 15 Minuten und maximal 60 Minuten pro Studierenden.

Die wesentlichen Gegenstände und Ergebnisse der *mündlichen Prüfung* sind in einem Protokoll festzuhalten. Das Ergebnis der Prüfung ist den Studierenden im Anschluss an die mündliche Prüfung bekannt zu geben.

Studierende, die sich in einem späteren Semester der gleichen Prüfung unterziehen wollen, werden entsprechend den räumlichen Verhältnissen und nach Zustimmung des Prüflings als Zuhörerinnen und Zuhörer bei mündlichen Prüfungen zugelassen. Die Zulassung erstreckt sich nicht auf die Beratung und Bekanntgabe der Prüfungsergebnisse.

(7) Für *Prüfungsleistungen anderer Art* (§ 4 Abs. 2 Nr. 3) sind angemessene Bearbeitungsfristen einzuräumen und Abgabetermine festzulegen. Dabei ist durch die Art der Aufgabenstellung und durch entsprechende Dokumentation sicherzustellen, dass die erbrachte Prüfungsleistung dem/der Studierenden zurechenbar ist. Die wesentlichen Gegenstände und Ergebnisse einer solchen Erfolgskontrolle sind in einem Protokoll festzuhalten.

Bei *mündlich* durchgeführten *Prüfungsleistungen anderer Art* muss neben der/dem Prüfenden ein/e Beisitzende/r anwesend sein, die/der zusätzlich zum/zur Prüfenden das Protokoll zeichnet.

Schriftliche Arbeiten im Rahmen einer *Prüfungsleistung anderer Art* haben dabei die folgende Erklärung zu tragen: „Ich versichere wahrheitsgemäß, die Arbeit selbstständig angefertigt, alle benutzten Hilfsmittel vollständig und genau angegeben und alles kenntlich gemacht zu haben, was aus Arbeiten anderer unverändert oder mit Abänderungen entnommen wurde." Trägt die Arbeit diese Erklärung nicht, wird sie nicht angenommen. Die wesentlichen Gegenstände und Ergebnisse der Erfolgskontrolle sind in einem Protokoll festzuhalten.

§ 6 a Erfolgskontrollen im Antwort-Wahl-Verfahren

Das Modulhandbuch regelt, ob und in welchem Umfang Erfolgskontrollen im Wege des *Antwort-Wahl-Verfahrens* abgelegt werden können

§ 6 b Computergestützte Erfolgskontrollen

(1) Erfolgskontrollen können computergestützt durchgeführt werden. Dabei wird die Antwort bzw. Lösung der/des Studierenden elektronisch übermittelt und, sofern möglich, automatisiert ausgewertet. Die Prüfungsinhalte sind von einer/einem Prüfenden zu erstellen.

(2) Vor der computergestützten Erfolgskontrolle hat die/der Prüfende sicherzustellen, dass die elektronischen Daten eindeutig identifiziert und unverwechselbar und dauerhaft den Studierenden zugeordnet werden können. Der störungsfreie Verlauf einer computergestützten Erfolgskontrolle ist durch entsprechende technische und fachliche Betreuung zu gewährleisten. Alle Prüfungsaufgaben müssen während der gesamten Bearbeitungszeit zur Bearbeitung zur Verfügung stehen.

(3) Im Übrigen gelten für die Durchführung von computergestützten Erfolgskontrollen die §§ 6 bzw. 6 a.

§ 7 Bewertung von Studien- und Prüfungsleistungen

(1) Das Ergebnis einer Prüfungsleistung wird von den jeweiligen Prüfenden in Form einer Note festgesetzt.

(2) Folgende Noten sollen verwendet werden:

sehr gut (very good)	:	hervorragende Leistung,
gut (good)	:	eine Leistung, die erheblich über den durchschnittlichen Anforderungen liegt,
befriedigend (satisfactory)	:	eine Leistung, die durchschnittlichen Anforderungen entspricht,
ausreichend (sufficient)	:	eine Leistung, die trotz ihrer Mängel noch den Anforderungen genügt,
nicht ausreichend (failed)	:	eine Leistung, die wegen erheblicher Mängel nicht den Anforderungen genügt.

Zur differenzierten Bewertung einzelner Prüfungsleistungen sind nur folgende Noten zugelassen:

1,0; 1,3	:	sehr gut
1,7; 2,0; 2,3	:	gut
2,7; 3,0; 3.3	:	befriedigend
3,7; 4,0	:	ausreichend
5,0	:	nicht ausreichend

(3) Studienleistungen werden mit „bestanden" oder mit „nicht bestanden" gewertet.

(4) Bei der Bildung der gewichteten Durchschnitte der Modulnoten, der Fachnoten und der Gesamtnote wird nur die erste Dezimalstelle hinter dem Komma berücksichtigt; alle weiteren Stellen werden ohne Rundung gestrichen.

(5) Jedes Modul und jede Erfolgskontrolle darf in demselben Studiengang nur einmal gewertet werden.

(6) Eine Prüfungsleistung ist bestanden, wenn die Note mindestens „ausreichend" (4,0) ist.

(7) Die Modulprüfung ist bestanden, wenn alle erforderlichen Erfolgskontrollen bestanden sind. Die Modulprüfung und die Bildung der Modulnote sollen im Modulhandbuch geregelt werden. Sofern das Modulhandbuch keine Regelung über die Bildung der Modulnote enthält, errechnet sich die Modulnote aus einem nach den Leistungspunkten der einzelnen Teilmodule gewichteter Notendurchschnitt. Die differenzierten Noten (Absatz 2) sind bei der Berechnung der Modulnoten als Ausgangsdaten zu verwenden.

(8) Die Ergebnisse der Erfolgskontrollen sowie die erworbenen Leistungspunkte werden durch den Studierendenservice des KIT verwaltet.

(9) Die Noten der Module eines Faches gehen in die Fachnote mit einem Gewicht proportional zu den ausgewiesenen Leistungspunkten der Module ein.

(10) Die Gesamtnote der Bachelorprüfung, die Fachnoten und die Modulnoten lauten:

		bis	1,5	=	sehr gut
von	1,6	bis	2,5	=	gut
von	2,6	bis	3,5	=	befriedigend
von	3,6	bis	4,0	=	ausreichend

§ 8 Orientierungsprüfungen, Verlust des Prüfungsanspruchs

(1) Die Teilmodulprüfungen Höhere Mathematik I, Technische Mechanik I, Technische Mechanik II in den Modulen Höhere Mathematik und Technische Mechanik sind bis zum Ende des Prüfungszeitraums des zweiten Fachsemesters abzulegen (Orientierungsprüfungen).

(2) Wer die Orientierungsprüfungen einschließlich etwaiger Wiederholungen bis zum Ende des Prüfungszeitraums des dritten Fachsemesters nicht erfolgreich abgelegt hat, verliert den Prüfungsanspruch im Studiengang, es sei denn, dass die Fristüberschreitung nicht selbst zu vertreten ist; hierüber entscheidet der Prüfungsausschuss auf Antrag der oder des Studierenden. Eine zweite Wiederholung der Orientierungsprüfungen ist ausgeschlossen.

Die Fristüberschreitung hat die/der Studierende insbesondere dann nicht zu vertreten, wenn eine qualifizierte Teilnahme am MINT-Kolleg im Sinne von § 3 Abs. 2 vorliegt. Ohne ausdrückliche Genehmigung des Vorsitzenden des Prüfungsausschusses gilt eine Fristüberschreitung von

1. einem Semester als genehmigt, wenn die/der Studierende eine qualifizierte Teilnahme am MINT-Kolleg gemäß § 3 Abs. 2 im Umfang von einem Semester nachweist oder
2. zwei Semestern als genehmigt, wenn die/der Studierende eine qualifizierte Teilnahme am MINT-Kolleg gemäß § 3 Abs. 2 im Umfang von zwei Semestern nachweist.

Als Nachweis gilt die vom MINT-Kolleg gemäß § 3 Abs. 2 auszustellende Bescheinigung, die beim Studierendenservice des KIT einzureichen ist. Im Falle von Nr. 1 kann der Vorsitzende des Prüfungsausschusses auf Antrag der Studierenden die Frist um ein weiteres Semester verlängern, wenn dies aus studienorganisatorischen Gründen für das fristgerechte Ablegen der Orientierungsprüfung erforderlich ist, insbesondere weil die Module, die Bestandteil der Orientierungsprüfung sind, nur einmal jährlich angeboten werden.

(3) Ist die Bachelorprüfung bis zum Ende des Prüfungszeitraums des neunten Fachsemesters einschließlich etwaiger Wiederholungen nicht vollständig abgelegt, so erlischt der Prüfungsanspruch im Studiengang Maschinenbau, es sei denn, dass die Fristüberschreitung nicht selbst zu vertreten ist. Die Entscheidung über eine Fristverlängerung und über Ausnahmen von der Fristregelung trifft der Prüfungsausschuss unter Beachtung der in § 32 Abs. 6 LHG genannten Tätigkeiten auf Antrag des/der Studierenden. Der Antrag ist schriftlich in der Regel bis sechs Wochen vor Ablauf der in Satz 1 genannten Studienhöchstdauer zu stellen. *Absatz 2 Satz 3 bis 5 gelten entsprechend.*

(4) Der Prüfungsanspruch geht auch verloren, wenn eine nach dieser Studien- und Prüfungsordnung erforderliche Studien- oder Prüfungsleistung endgültig nicht bestanden ist oder eine Wiederholungsprüfung nach § 9 Abs. 6 nicht rechtzeitig erbracht wurde, es sei denn die Fristüberschreitung ist nicht selbst zu vertreten.

§ 9 Wiederholung von Erfolgskontrollen, endgültiges Nichtbestehen

(1) Studierende können eine nicht bestandene schriftliche Prüfung (§ 4 Absatz 2 Nr. 1) einmal wiederholen. Wird eine schriftliche Wiederholungsprüfung mit „nicht ausreichend“ (5,0) bewertet, so findet eine mündliche Nachprüfung im zeitlichen Zusammenhang mit dem Termin der nicht bestandenen Prüfung statt. In diesem Falle kann die Note dieser Prüfung nicht besser als „ausreichend“ (4,0) sein.

(2) Studierende können eine nicht bestandene mündliche Prüfung (§ 4 Absatz 2 Nr. 2) einmal wiederholen.

(3) Wiederholungsprüfungen nach Absatz 1 und 2 müssen in Inhalt, Umfang und Form (mündlich oder schriftlich) der ersten entsprechen. Ausnahmen kann der zuständige Prüfungsausschuss auf Antrag zulassen.

(4) Prüfungsleistungen anderer Art (§ 4 Absatz 2 Nr. 3) können einmal wiederholt werden.

(5) Studienleistungen können mehrfach wiederholt werden.

(6) Die Wiederholung von Prüfungsleistungen hat spätestens bis zum Ende des Prüfungszeitraumes des übernächsten Semesters zu erfolgen.

(7) Die Prüfungsleistung ist endgültig nicht bestanden, wenn die mündliche Nachprüfung im Sinne des Absatzes 1 mit „nicht ausreichend“ (5,0) bewertet wurde. Die Prüfungsleistung ist ferner endgültig nicht bestanden, wenn die mündliche Prüfung im Sinne des Absatzes 2 oder die Prüfungsleistung anderer Art gemäß Absatz 4 zweimal mit „nicht bestanden“ bewertet wurde.

(8) Das Modul ist endgültig nicht bestanden, wenn eine für sein Bestehen erforderliche Prüfungsleistung endgültig nicht bestanden ist.

(9) Eine zweite Wiederholung derselben Prüfungsleistung gemäß § 4 Abs. 2 ist nur in Ausnahmefällen auf Antrag des/der Studierenden zulässig („Antrag auf Zweitwiederholung“). Der Antrag ist schriftlich beim Prüfungsausschuss in der Regel bis zwei Monate nach Bekanntgabe der Note zu stellen.

Über den ersten Antrag eines/einer Studierenden auf Zweitwiederholung entscheidet der Prüfungsausschuss, wenn er den Antrag genehmigt. Wenn der Prüfungsausschuss diesen Antrag ablehnt, entscheidet ein Mitglied des Präsidiums. Über weitere Anträge auf Zweitwiederholung entscheidet nach Stellungnahme des Prüfungsausschusses ein Mitglied des Präsidiums. Wird der Antrag genehmigt, hat die Zweitwiederholung spätestens zum übernächsten Prüfungstermin zu erfolgen. Absatz 1 Satz 2 und 3 gelten entsprechend.

(10) Die Wiederholung einer bestandenen Prüfungsleistung ist nicht zulässig.

(11) Die Bachelorarbeit kann bei einer Bewertung mit „nicht ausreichend“ (5,0) einmal wiederholt werden. Eine zweite Wiederholung der Bachelorarbeit ist ausgeschlossen.

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§ 10 Abmeldung; Versäumnis, Rücktritt

(1) Studierende können ihre Anmeldung zu *schriftlichen Prüfungen* ohne Angabe von Gründen bis zur Ausgabe der Prüfungsaufgaben widerrufen (Abmeldung). Eine Abmeldung kann online im Studierendenportal bis 24:00 Uhr des Vortages der Prüfung oder in begründeten Ausnahmefällen beim Studierendenservice innerhalb der Geschäftszeiten erfolgen. Erfolgt die Abmeldung gegenüber dem/der Prüfenden hat diese/r Sorge zu tragen, dass die Abmeldung im Campus Management System verbucht wird.

(2) Bei *mündlichen Prüfungen* muss die Abmeldung spätestens drei Werktage vor dem betreffenden Prüfungstermin gegenüber dem/der Prüfenden erklärt werden. Der Rücktritt von einer mündlichen Prüfung weniger als drei Werktage vor dem betreffenden Prüfungstermin ist nur unter den Voraussetzungen des Absatzes 5 möglich. Der Rücktritt von mündlichen Nachprüfungen im Sinne von § 9 Abs. 1 ist grundsätzlich nur unter den Voraussetzungen von Absatz 5 möglich.

(3) Die Abmeldung von *Prüfungsleistungen anderer Art* sowie von *Studienleistungen* ist im Modulhandbuch geregelt.

(4) Eine Erfolgskontrolle gilt als mit „nicht ausreichend“ (5,0) bewertet, wenn die Studierenden einen Prüfungstermin ohne triftigen Grund versäumen oder wenn sie nach Beginn der Erfolgskontrolle ohne triftigen Grund von dieser zurücktreten. Dasselbe gilt, wenn die Bachelorarbeit nicht innerhalb der vorgesehenen Bearbeitungszeit erbracht wird, es sei denn, der/die Studierende hat die Fristüberschreitung nicht zu vertreten.

(5) Der für den Rücktritt nach Beginn der Erfolgskontrolle oder das Versäumnis geltend gemachte Grund muss dem Prüfungsausschuss unverzüglich schriftlich angezeigt und glaubhaft gemacht werden. Bei Krankheit des/der Studierenden oder eines allein zu versorgenden Kindes oder pflegebedürftigen Angehörigen kann die Vorlage eines ärztlichen Attestes verlangt werden.

§ 11 Täuschung, Ordnungsverstoß

(1) Versuchen Studierende das Ergebnis ihrer Erfolgskontrolle durch Täuschung oder Benutzung nicht zugelassener Hilfsmittel zu beeinflussen, gilt die betreffende Erfolgskontrolle als mit „nicht ausreichend“ (5,0) bewertet.

(2) Studierende, die den ordnungsgemäßen Ablauf einer Erfolgskontrolle stören, können von der/dem Prüfenden oder der Aufsicht führenden Person von der Fortsetzung der Erfolgskontrolle ausgeschlossen werden. In diesem Fall gilt die betreffende Erfolgskontrolle als mit „nicht ausreichend“ (5,0) bewertet. In schwerwiegenden Fällen kann der Prüfungsausschuss diese Studierenden von der Erbringung weiterer Erfolgskontrollen ausschließen.

(3) Näheres regelt die Allgemeine Satzung des KIT zur Redlichkeit bei Prüfungen und Praktika in der jeweils gültigen Fassung.

§ 12 Mutterschutz, Elternzeit, Wahrnehmung von Familienpflichten

(1) Auf Antrag sind die Mutterschutzfristen, wie sie im jeweils gültigen Gesetz zum Schutz der erwerbstätigen Mutter (Mutterschutzgesetz - MuSchG) festgelegt sind, entsprechend zu berücksichtigen. Dem Antrag sind die erforderlichen Nachweise beizufügen. Die Mutterschutzfristen unterbrechen jede Frist nach dieser Prüfungsordnung. Die Dauer des Mutterschutzes wird nicht in die Frist eingerechnet.

(2) Gleichfalls sind die Fristen der Elternzeit nach Maßgabe des jeweils gültigen Gesetzes (Bundeselterngeld- und Elternzeitgesetz - BEEG) auf Antrag zu berücksichtigen. Der/die Studierende muss bis spätestens vier Wochen vor dem Zeitpunkt, von dem an die Elternzeit angetreten werden soll, dem Prüfungsausschuss, unter Beifügung der erforderlichen Nachweise schriftlich mitteilen, in welchem Zeitraum die Elternzeit in Anspruch genommen werden soll. Der Prüfungsausschuss hat zu prüfen, ob die gesetzlichen Voraussetzungen vorliegen, die bei einer Arbeitnehmerin bzw. einem Arbeitnehmer den Anspruch auf Elternzeit auslösen würden, und teilt dem/der Studierenden das Ergebnis sowie die neu festgesetzten Prüfungszeiten unverzüglich mit. Die Bearbeitungszeit der Bachelorarbeit kann nicht durch Elternzeit unterbrochen werden. Die gestellte Arbeit gilt als nicht vergeben. Nach Ablauf der Elternzeit erhält der/die Studierende ein neues Thema, das innerhalb der in § 14 festgelegten Bearbeitungszeit zu bearbeiten ist.

(3) Der Prüfungsausschuss entscheidet auf Antrag über die flexible Handhabung von Prüfungsfristen entsprechend den Bestimmungen des Landeshochschulgesetzes, wenn Studierende Familienpflichten wahrzunehmen haben. Absatz 2 Satz 4 bis 6 gelten entsprechend.

§ 13 Studierende mit Behinderung oder chronischer Erkrankung

(1) Bei der Gestaltung und Organisation des Studiums sowie der Prüfungen sind die Belange Studierender mit Behinderung oder chronischer Erkrankung zu berücksichtigen. Insbesondere ist Studierenden mit Behinderung oder chronischer Erkrankung bevorzugter Zugang zu teilnahmebegrenzten Lehrveranstaltungen zu gewähren und die Reihenfolge für das Absolvieren bestimmter Lehrveranstaltungen entsprechend ihrer Bedürfnisse anzupassen. Studierende sind gemäß Bundesgleichstellungsgesetz (BGG) und Sozialgesetzbuch Neuntes Buch (SGB IX) behindert, wenn ihre körperliche Funktion, geistige Fähigkeit oder seelische Gesundheit mit hoher Wahrscheinlichkeit länger als sechs Monate von dem für das Lebensalter typischen Zustand abweichen und daher ihre Teilhabe am Leben in der Gesellschaft beeinträchtigt ist. Der Prüfungsausschuss entscheidet auf Antrag der/des Studierenden über das Vorliegen der Voraussetzungen nach Satz 2 und 3. Die/der Studierende hat die entsprechenden Nachweise vorzulegen.

(2) Weisen Studierende eine Behinderung oder chronische Erkrankung nach und folgt daraus, dass sie nicht in der Lage sind, Erfolgskontrollen ganz oder teilweise in der vorgeschriebenen Zeit oder Form abzulegen, kann der Prüfungsausschuss gestatten, die Erfolgskontrollen in einem anderen Zeitraum oder einer anderen Form zu erbringen. Insbesondere ist behinderten Studierenden zu gestatten, notwendige Hilfsmittel zu benutzen.

(3) Weisen Studierende eine Behinderung oder chronische Erkrankung nach und folgt daraus, dass sie nicht in der Lage sind, die Lehrveranstaltungen regelmäßig zu besuchen oder die gemäß § 20 erforderlichen Studien- und Prüfungsleistungen zu erbringen, kann der Prüfungsausschuss auf Antrag gestatten, dass einzelne Studien- und Prüfungsleistungen nach Ablauf der in dieser Studien- und Prüfungsordnung vorgesehenen Fristen absolviert werden können.

§ 14 Modul Bachelorarbeit

(1) Voraussetzung für die Zulassung zum Modul Bachelorarbeit ist, dass die/der Studierende Modulprüfungen im Umfang von 120 LP erfolgreich abgelegt hat. Über Ausnahmen entscheidet der Prüfungsausschuss auf Antrag der/des Studierenden.

(1 a) Dem Modul Bachelorarbeit sind 15 LP zugeordnet. Es besteht aus der Bachelorarbeit und einer Präsentation. Die Präsentation hat spätestens sechs Wochen nach Abgabe der Bachelorarbeit zu erfolgen.

(2) Die Bachelorarbeit kann von Hochschullehrer/innen und leitenden Wissenschaftler/innen gemäß § 14 Abs. 3 Ziff. 1 KITG vergeben werden. Darüber hinaus kann der Prüfungsausschuss weitere Prüfende gemäß § 18 Abs. 2 und 3 zur Vergabe des Themas berechtigen. Den Studierenden ist Gelegenheit zu geben, für das Thema Vorschläge zu machen. Soll die Bachelorarbeit außerhalb der KIT-Fakultät für Maschinenbau angefertigt werden, so bedarf dies der Genehmigung durch den Prüfungsausschuss. Die Bachelorarbeit kann auch in Form einer Gruppenarbeit zugelassen werden, wenn der als Prüfungsleistung zu bewertende Beitrag der einzelnen Studierenden aufgrund objektiver Kriterien, die eine eindeutige Abgrenzung ermöglichen, deutlich unterscheidbar ist und die Anforderung nach Absatz 4 erfüllt. In Ausnahmefällen sorgt die/der Vorsitzende des Prüfungsausschusses auf Antrag der oder des Studierenden dafür, dass die/der Studierende innerhalb von vier Wochen ein Thema für die Bachelorarbeit erhält. Die Ausgabe des Themas erfolgt in diesem Fall über die/den Vorsitzende/n des Prüfungsausschusses.

(3) Thema, Aufgabenstellung und Umfang der Bachelorarbeit sind von dem Betreuer bzw. der Betreuerin so zu begrenzen, dass sie mit dem in Absatz 4 festgelegten Arbeitsaufwand bearbeitet werden kann.

(4) Die Bachelorarbeit soll zeigen, dass die Studierenden in der Lage sind, ein Problem aus ihrem Studienfach selbstständig und in begrenzter Zeit nach wissenschaftlichen Methoden zu bearbeiten. Der Umfang der Bachelorarbeit entspricht 12 Leistungspunkten. Die maximale Bearbeitungsdauer beträgt drei Monate. Thema und Aufgabenstellung sind an den vorgesehenen Umfang anzupassen. Der Prüfungsausschuss legt fest, in welchen Sprachen die Bachelorarbeit geschrieben werden kann. Auf Antrag des Studierenden kann der/die Prüfende genehmigen, dass die Bachelorarbeit in einer anderen Sprache als Deutsch geschrieben wird.

(5) Bei der Abgabe der Bachelorarbeit haben die Studierenden schriftlich zu versichern, dass sie die Arbeit selbstständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt haben, die wörtlich oder inhaltlich übernommenen Stellen als solche kenntlich gemacht und die Satzung des KIT zur Sicherung guter wissenschaftlicher Praxis in der jeweils gültigen Fassung beachtet haben. Wenn diese Erklärung nicht enthalten ist, wird die Arbeit nicht angenommen. Die Erklärung kann wie folgt lauten: „Ich versichere wahrheitsgemäß, die Arbeit selbstständig verfasst, alle benutzten Hilfsmittel vollständig und genau angegeben und alles kenntlich gemacht zu haben, was aus Arbeiten anderer unverändert oder mit Abänderungen entnommen wurde sowie die Satzung des KIT zur Sicherung guter wissenschaftlicher Praxis in der jeweils gültigen Fassung beachtet zu haben." Bei Abgabe einer unwahren Versicherung wird die Bachelorarbeit mit „nicht ausreichend" (5,0) bewertet.

(6) Der Zeitpunkt der Ausgabe des Themas der Bachelorarbeit ist durch die Betreuerin/den Betreuer und die/den Studierenden festzuhalten und dies beim Prüfungsausschuss aktenkundig zu machen. Der Zeitpunkt der Abgabe der Bachelorarbeit ist durch den/die Prüfende/n beim Prüfungsausschuss aktenkundig zu machen. Das Thema kann nur einmal und nur innerhalb des ersten Monats der Bearbeitungszeit zurückgegeben werden. Macht der oder die Studierende einen triftigen Grund geltend, kann der Prüfungsausschuss die in Absatz 3 festgelegte Bearbeitungszeit auf Antrag der oder des Studierenden um höchstens einen Monat verlängern. Wird die Bachelorarbeit nicht fristgerecht abgeliefert, gilt sie als mit „nicht ausreichend" (5,0) bewertet, es sei denn, dass die Studierenden dieses Versäumnis nicht zu vertreten haben.

(7) Die Bachelorarbeit wird von mindestens einem/einer Hochschullehrer/in oder einem/einer leitenden Wissenschaftler/in gemäß § 14 abs. 3 Ziff. 1 KITG und einem/einer weiteren Prüfenden bewertet. In der Regel ist eine/r der Prüfenden die Person, die die Arbeit gemäß Absatz 2 vergeben hat. Bei nicht übereinstimmender Beurteilung dieser beiden Personen setzt der Prüfungsausschuss im Rahmen der Bewertung dieser beiden Personen die Note der Bachelorarbeit fest; er kann auch einen weiteren Gutachter bestellen. Die Bewertung hat innerhalb von sechs Wochen nach Abgabe der Bachelorarbeit zu erfolgen.

§ 15 Zusatzleistungen

(1) Es können auch weitere Leistungspunkte (Zusatzleistungen) im Umfang von höchstens 30 LP aus dem Gesamtangebot des KIT erworben werden. § 3 und § 4 der Prüfungsordnung bleiben davon unberührt. Diese Zusatzleistungen gehen nicht in die Festsetzung der Gesamt- und Modulnoten ein. Die bei der Festlegung der Modulnote nicht berücksichtigten LP werden als Zusatzleistungen im Transcript of Records aufgeführt und als Zusatzleistungen gekennzeichnet. Auf Antrag der/des Studierenden werden die Zusatzleistungen in das Bachelorzeugnis aufgenommen und als Zusatzleistungen gekennzeichnet. Zusatzleistungen werden mit den nach § 7 vorgesehenen Noten gelistet.

(2) Die Studierenden haben bereits bei der Anmeldung zu einer Prüfung in einem Modul diese als Zusatzleistung zu deklarieren.

§ 15 a Mastervorzug

Studierende, die im Bachelorstudium bereits mindestens 120 LP erworben haben, können zusätzlich zu den in § 15 Abs. 1 genannten Zusatzleistungen Leistungspunkte aus einem konsekutiven Masterstudiengang am KIT im Umfang von höchstens 30 LP erwerben (Mastervorzugsleistungen). § 3 und § 4 der Prüfungsordnung bleiben davon unberührt. Die Mastervorzugsleistungen gehen nicht in die Festsetzung der Gesamt-, Fach- und Modulnoten ein. Sie werden im Transcript of Records aufgeführt und als solche gekennzeichnet sowie mit den nach § 7 vorgesehenen Noten gelistet. § 15 Absatz 2 gilt entsprechend.

§ 16 Überfachliche Qualifikationen

Neben der Vermittlung von fachlichen Qualifikationen ist der Auf- und Ausbau überfachlicher Qualifikationen im Umfang von mindestens 6 LP Bestandteil eines Bachelorstudiums. Überfachliche Qualifikationen können additiv oder integrativ vermittelt werden.

§ 17 Prüfungsausschüsse

(1) Für den Bachelorstudiengang werden Prüfungsausschüsse gebildet. Sie bestehen jeweils aus vier stimmberechtigten Mitgliedern: zwei Hochschullehrer/innen / leitenden Wissenschaftler/innen gemäß § 14 Abs. 3 Ziff. 1 KITG / Privatdozentinnen bzw. -dozenten, zwei akademischen Mitarbeiterinnen und Mitarbeitern nach § 52 LHG / wissenschaftlichen Mitarbeiter/innen gemäß § 14 Abs. 3 Ziff. 2 KITG und einer bzw. einem Studierenden mit beratender Stimme. Im Falle der Einrichtung eines gemeinsamen Prüfungsausschusses für den Bachelor- und den Masterstudiengang Maschinenbau erhöht sich die Anzahl der Studierenden auf zwei Mitglieder mit beratender Stimme, wobei je eine bzw. einer dieser Beiden aus dem Bachelor- und aus dem Masterstudiengang stammt. Die Amtszeit der nichtstudentischen Mitglieder beträgt zwei Jahre, die des studentischen Mitglieds ein Jahr.

(2) Die/der Vorsitzende, ihre/sein Stellvertreter/in, die weiteren Mitglieder des jeweiligen Prüfungsausschusses sowie deren Stellvertreter/innen werden von dem KIT-Fakultätsrat bestellt, die akademischen Mitarbeiter/innen nach § 52 LHG, die wissenschaftlichen Mitarbeiter gemäß § 14 Abs. 3 Ziff. 2 KITG und die Studierenden auf Vorschlag der Mitglieder der jeweiligen Gruppe; Wiederbestellung ist möglich. Die/der Vorsitzende und deren/dessen Stellvertreter/in müssen Hochschullehrer/innen oder leitende Wissenschaftler/innen § 14 Abs. 3 Ziff. 1 KITG sein. Die/der Vorsitzende des jeweiligen Prüfungsausschusses nimmt die laufenden Geschäfte wahr und wird durch das jeweilige Prüfungssekretariat unterstützt.

(3) Der jeweilige Prüfungsausschuss achtet auf die Einhaltung der Bestimmungen dieser Studien- und Prüfungsordnung und fällt die Entscheidungen in Prüfungsangelegenheiten. Er entscheidet über die Anerkennung von Studienzeiten sowie Studien- und Prüfungsleistungen und trifft die Feststellung gemäß § 19 Absatz 1 Satz 1. Er berichtet der KIT-Fakultät regelmäßig über die Entwicklung der Prüfungs- und Studienzeiten, einschließlich der Bearbeitungszeiten für die Bachelorarbeiten und die Verteilung der Modul- und Gesamtnoten. Er ist zuständig für Anregungen zur Reform der Studien- und Prüfungsordnung und zu Modulbeschreibungen. Der Prüfungsausschuss entscheidet mit der Mehrheit seiner Stimmen. Bei Stimmengleichheit entscheidet der Vorsitzende des Prüfungsausschusses.

(4) Der Prüfungsausschuss kann die Erledigung seiner Aufgaben für alle Regelfälle auf die/den Vorsitzende/n des Prüfungsausschusses übertragen. In dringenden Angelegenheiten, deren Erledigung nicht bis zu der nächsten Sitzung des Prüfungsausschusses warten kann, entscheidet die/der Vorsitzende des Prüfungsausschusses.

(5) Die Mitglieder des Prüfungsausschusses haben das Recht, der Abnahme von Prüfungen beizuwohnen. Die Mitglieder des Prüfungsausschusses, die Prüfenden und die Beisitzenden unterliegen der Verschwiegenheit. Sofern sie nicht im öffentlichen Dienst stehen, sind sie durch die/den Vorsitzende/n zur Verschwiegenheit zu verpflichten.

(6) In Angelegenheiten des Prüfungsausschusses, die eine an einer anderen KIT-Fakultät zu absolvierende Prüfungsleistung betreffen, ist auf Antrag eines Mitgliedes des Prüfungsausschusses eine fachlich zuständige und von der betroffenen KIT-Fakultät zu nennende prüfungsberechtigte Person hinzuzuziehen.

(7) Belastende Entscheidungen des Prüfungsausschusses sind schriftlich mitzuteilen. Sie sind zu begründen und mit einer Rechtsbehelfsbelehrung zu versehen. Vor einer Entscheidung ist Gelegenheit zur Äußerung zu geben. Widersprüche gegen Entscheidungen des Prüfungsausschusses sind innerhalb eines Monats nach Zugang der Entscheidung schriftlich oder zur Niederschrift beim Präsidium des KIT einzulegen.

§ 18 Prüfende und Beisitzende

(1) Der Prüfungsausschuss bestellt die Prüfenden. Er kann die Bestellung der/dem Vorsitzenden übertragen.

(2) Prüfende sind Hochschullehr/innen sowie leitende Wissenschaftler/innen gemäß § 14 Abs. 3 Ziff. 1 KITG, habilitierte Mitglieder und akademische Mitarbeiter/innen gemäß § 52 LHG, welche der KIT-Fakultät angehören und denen die Prüfungsbefugnis übertragen wurde; desgleichen kann wissenschaftlichen Mitarbeitern gemäß § 14 Abs. 3 Ziff. 2 KITG die Prüfungsbefugnis übertragen werden. Bestellt werden darf nur, wer mindestens die dem jeweiligen Prüfungsgegenstand entsprechende fachwissenschaftliche Qualifikation erworben hat.

(3) Soweit Lehrveranstaltungen von anderen als den unter Absatz 2 genannten Personen durchgeführt werden, sollen diese zu Prüfenden bestellt werden, sofern die KIT-Fakultät eine Prüfungsbefugnis erteilt hat und sie die gemäß Absatz 2 Satz 2 vorausgesetzte Qualifikation nachweisen können.

(4) Die Beisitzenden werden durch die Prüfenden benannt. Zu Beisitzenden darf nur bestellt werden, wer einen akademischen Abschluss in einem mathematisch-naturwissenschaftlichen oder ingenieurwissenschaftlichen Studiengang oder einen gleichwertigen akademischen Abschluss erworben hat.

§ 19 Anerkennung von Studien- und Prüfungsleistungen, Studienzeiten

(1) Studien- und Prüfungsleistungen sowie Studienzeiten, die in Studiengängen an staatlichen oder staatlich anerkannten Hochschulen und Berufsakademien der Bundesrepublik Deutschland oder an ausländischen staatlichen oder staatlich anerkannten Hochschulen erbracht wurden, werden auf Antrag der Studierenden anerkannt, sofern hinsichtlich der erworbenen Kompetenzen kein wesentlicher Unterschied zu den Leistungen oder Abschlüssen besteht, die ersetzt werden sollen. Dabei ist kein schematischer Vergleich, sondern eine Gesamtbetrachtung vorzunehmen. Bezüglich des Umfangs einer zur Anerkennung vorgelegten Studienleistung bzw. Prüfungsleistung (Anrechnung) werden die Grundsätze des ECTS herangezogen.

(2) Die Studierenden haben die für die Anerkennung erforderlichen Unterlagen vorzulegen. Studierende, die neu in den Studiengang Maschinenbau immatrikuliert wurden, haben den Antrag mit den für die Anerkennung erforderlichen Unterlagen innerhalb eines Semesters nach Immatrikulation zu stellen. Bei Unterlagen, die nicht in deutscher oder englischer Sprache vorliegen, kann eine amtlich beglaubigte Übersetzung verlangt werden. Die Beweislast dafür, dass der Antrag die Voraussetzungen für die Anerkennung nicht erfüllt, liegt beim Prüfungsausschuss.

(3) Werden Leistungen angerechnet, die nicht am KIT erbracht wurden, werden sie im Zeugnis als „anerkannt“ ausgewiesen. Liegen Noten vor, werden die Noten, soweit die Notensysteme vergleichbar sind, übernommen und in die Berechnung der Modulnoten und der Gesamtnote einbezogen. Sind die Notensysteme nicht vergleichbar, können die Noten umgerechnet werden. Liegen keine Noten vor, wird der Vermerk „bestanden“ aufgenommen.

(4) Bei der Anerkennung von Studien- und Prüfungsleistungen, die außerhalb der Bundesrepublik Deutschland erbracht wurden, sind die von der Kultusministerkonferenz und der Hochschulrektorenkonferenz gebilligten Äquivalenzvereinbarungen sowie Absprachen im Rahmen der Hochschulpartnerschaften zu beachten.

(5) Außerhalb des Hochschulsystems erworbene Kenntnisse und Fähigkeiten werden angerechnet, wenn sie nach Inhalt und Niveau den Studien- und Prüfungsleistungen gleichwertig sind, die ersetzt werden sollen und die Institution, in der die Kenntnisse und Fähigkeiten erworben wurden, ein genormtes Qualitätssicherungssystem hat. Die Anrechnung kann in Teilen versagt werden, wenn mehr als 50 Prozent des Hochschulstudiums ersetzt werden soll.

(6) Zuständig für Anerkennung und Anrechnung ist der jeweilige Prüfungsausschuss. Im Rahmen der Feststellung, ob ein wesentlicher Unterschied im Sinne des Absatz 1 vorliegt, sind die zuständigen Fachvertreter/innen zu hören. Der jeweilige Prüfungsausschuss entscheidet in Abhängigkeit von Art und Umfang der anzurechnenden Studien- und Prüfungsleistungen über die Einstufung in ein höheres Fachsemester.

II. Bachelorprüfung

§ 20 Umfang und Art der Bachelorprüfung

(1) Die Bachelorprüfung besteht aus den Modulprüfungen nach Absatz 2 sowie dem Modul Bachelorarbeit (§ 14).

(2) Es sind Modulprüfungen in folgenden Pflichtfächern abzulegen:

1. Ingenieurwissenschaftliche Grundlagen: Modul(e) im Umfang von 143 LP,
2. Vertiefung im Maschinenbau: Modul(e) im Umfang von 16 LP,
3. Überfachliche Qualifikationen im Umfang von 6 LP gemäß § 16.

Die Festlegung der zur Auswahl stehenden Module und deren Fachzuordnung werden im Modulhandbuch getroffen.

§ 21 Bestehen der Bachelorprüfung, Bildung der Gesamtnote

(1) Die Bachelorprüfung ist bestanden, wenn alle in § 20 genannten Modulprüfungen mindestens mit „ausreichend“ bewertet wurden.

(2) Die Gesamtnote der Bachelorprüfung errechnet sich als ein mit Leistungspunkten gewichteter Notendurchschnitt der Fachnoten sowie des Moduls Bachelorarbeit.

Dabei wird die Note des Moduls Bachelorarbeit mit dem doppelten Gewicht gegenüber den Noten der übrigen Fächer berücksichtigt.

(3) Haben Studierende die Bachelorarbeit mit der Note 1,0 und die Bachelorprüfung mit einem Durchschnitt von 1,2 oder besser abgeschlossen, so wird das Prädikat „mit Auszeichnung“ (with distinction) verliehen.

§ 22 Bachelorzeugnis, Bachelorurkunde, Diploma Supplement und Transcript of Records

(1) Über die Bachelorprüfung werden nach Bewertung der letzten Prüfungsleistung eine Bachelorurkunde und ein Zeugnis erstellt. Die Ausfertigung von Bachelorurkunde und Zeugnis soll nicht später als drei Monate nach Ablegen der letzten Prüfungsleistung erfolgen. Bachelorurkunde und Bachelorzeugnis werden in deutscher und englischer Sprache ausgestellt. Bachelorurkunde und Zeugnis tragen das Datum der erfolgreichen Erbringung der letzten Prüfungsleistung. Diese Dokumente werden den Studierenden zusammen ausgehändigt. In der Bachelorurkunde wird die Verleihung des akademischen Bachelorgrades beurkundet. Die Bachelorurkunde wird von dem Präsidenten und der KIT-Dekanin/ dem KIT-Dekan der KIT-Fakultät unterzeichnet und mit dem Siegel des KIT versehen.

(2) Das Zeugnis enthält die Fach- und Modulnoten sowie die den Modulen und Fächern zugeordnete Leistungspunkte und die Gesamtnote. Sofern gemäß § 7 Abs. 2 Satz 2 eine differenzierte Bewertung einzelner Prüfungsleitungen vorgenommen wurde, wird auf dem Zeugnis auch die entsprechende Dezimalnote ausgewiesen; § 7 Abs. 4 bleibt unberührt. Das Zeugnis ist von der KIT-Dekanin/ dem KIT-Dekan der KIT-Fakultät und von der/dem Vorsitzenden des jeweiligen Prüfungsausschusses zu unterzeichnen.

(3) Mit dem Zeugnis erhalten die Studierenden ein Diploma Supplement in deutscher und englischer Sprache, das den Vorgaben des jeweils gültigen ECTS Users' Guide entspricht, sowie ein Transcript of Records in deutscher und englischer Sprache.

(4) Das Transcript of Records enthält in strukturierter Form alle erbrachten Studien- und Prüfungsleistungen. Dies beinhaltet alle Fächer und Fachnoten samt den zugeordneten Leistungspunkten, die dem jeweiligen Fach zugeordneten Module mit den Modulnoten und zugeordneten Leistungspunkten sowie die den Modulen zugeordneten Erfolgskontrollen samt Noten und zugeordneten Leistungspunkten. Absatz 2 Satz 2 gilt entsprechend. Aus dem Transcript of Records soll die Zugehörigkeit von Lehrveranstaltungen zu den einzelnen Modulen deutlich erkennbar sein. Angerechnete Studien- und Prüfungsleistungen sind im Transcript of Records aufzunehmen. Alle Zusatzleistungen werden im Transcript of Records aufgeführt.

(5) Die Bachelorurkunde, das Bachelorzeugnis und das Diploma Supplement einschließlich des Transcript of Records werden vom Studierendenservice des KIT ausgestellt.

III. Schlussbestimmungen

§ 23 Bescheinigung von Prüfungsleistungen

Haben Studierende die Bachelorprüfung endgültig nicht bestanden, wird ihnen auf Antrag und gegen Vorlage der Exmatrikulationsbescheinigung eine schriftliche Bescheinigung ausgestellt, die die erbrachten Studien- und Prüfungsleistungen und deren Noten enthält und erkennen lässt, dass die Prüfung insgesamt nicht bestanden ist. Dasselbe gilt, wenn der Prüfungsanspruch erloschen ist.

§ 24 Aberkennung des Bachelorgrades

(1) Haben Studierende bei einer Prüfungsleistung getäuscht und wird diese Tatsache nach der Aushändigung des Zeugnisses bekannt, so können die Noten der Modulprüfungen, bei denen getäuscht wurde, berichtigt werden. Gegebenenfalls kann die Modulprüfung für „nicht ausreichend“ (5,0) und die Bachelorprüfung für „nicht bestanden“ erklärt werden.

(2) Waren die Voraussetzungen für die Zulassung zu einer Prüfung nicht erfüllt, ohne dass Studierende darüber täuschen wollte, und wird diese Tatsache erst nach Aushändigung des Zeugnisses bekannt, wird dieser Mangel durch das Bestehen der Prüfung geheilt. Hat die/der Studierende die Zulassung vorsätzlich zu Unrecht erwirkt, so kann die Modulprüfung für „nicht ausreichend“ (5,0) und die Bachelorprüfung für „nicht bestanden“ erklärt werden.

(3) Vor einer Entscheidung des Prüfungsausschusses ist Gelegenheit zur Äußerung zu geben.

(4) Das unrichtige Zeugnis ist zu entziehen und gegebenenfalls ein neues zu erteilen. Mit dem unrichtigen Zeugnis ist auch die Bachelorurkunde einzuziehen, wenn die Bachelorprüfung aufgrund einer Täuschung für „nicht bestanden“ erklärt wurde.

(5) Eine Entscheidung nach Absatz 1 und Absatz 2 Satz 2 ist nach einer Frist von fünf Jahren ab dem Datum des Zeugnisses ausgeschlossen.

(6) Die Aberkennung des akademischen Grades richtet sich nach § 36 Abs. 7 LHG.

§ 25 Einsicht in die Prüfungsakten

(1) Nach Abschluss der Bachelorprüfung wird den Studierenden auf Antrag innerhalb eines Jahres Einsicht in das Prüfungsexemplar ihrer Bachelorarbeit, die darauf bezogenen Gutachten und in die Prüfungsprotokolle gewährt.

(2) Für die Einsichtnahme in die schriftlichen Modulprüfungen, schriftlichen Modulteilprüfungen bzw. Prüfungsprotokolle gilt eine Frist von einem Monat nach Bekanntgabe des Prüfungsergebnisses.

(3) Der/die Prüfende bestimmt Ort und Zeit der Einsichtnahme.

(4) Prüfungsunterlagen sind mindestens fünf Jahre aufzubewahren.

§ 26 Inkrafttreten, Übergangsvorschriften

(1) Diese Studien- und Prüfungsordnung tritt am 01. Oktober 2016 in Kraft.

(2) Gleichzeitig tritt die Studien- und Prüfungsordnung des KIT für den Bachelorstudiengang Maschinenbau vom 28. Februar 2008 (Amtliche Bekanntmachung des KIT Nr. 78 vom 09. September 2008), zuletzt geändert durch Satzung vom 24. September 2014 (Amtliche Bekanntmachung des KIT Nr. 53 vom 01. Oktober 2014), außer Kraft.

(3) Studierende, die auf Grundlage der Studien- und Prüfungsordnung für den Bachelorstudiengang Maschinenbau vom 28. Februar 2008 (Amtliche Bekanntmachung des KIT Nr. 78 vom 09. September 2008), zuletzt geändert durch Satzung vom 24. September 2014 (Amtliche Bekanntmachung des KIT Nr. 53 vom 01. Oktober 2014), ihr Studium am KIT aufgenommen haben, können Prüfungen auf Grundlage dieser Studien- und Prüfungsordnung letztmalig am 30. September 2021 ablegen.

(4) Studierende, die auf Grundlage der Studien- und Prüfungsordnung für den Bachelorstudiengang Maschinenbau vom 28. Februar 2008 (Amtliche Bekanntmachung des KIT Nr. 78 vom 09. September 2008), zuletzt geändert durch Satzung vom 24. September 2014 (Amtliche Bekanntmachung des KIT Nr. 53 vom 01. Oktober 2014), ihr Studium am KIT aufgenommen haben, können auf Antrag ihr Studium nach der vorliegenden Studien- und Prüfungsordnung fortsetzen.

(5) Die Prüfungsordnung für den Diplomstudiengang Maschinenbau vom 27. Juli 2000 (Amtliche Bekanntmachung der Universität Karlsruhe (TH) Nr. 18 vom 15. August 2000, S. 107 ff.) bleibt außer Kraft. Studierende, die auf Grundlage der Prüfungsordnung für den Diplomstudiengang Maschinenbau vom 27. Juli 2000 (Amtliche Bekanntmachung der Universität Karlsruhe (TH) Nr. 18 vom 15. August 2000, S. 107 ff.) ihr Studium an der Universität Karlsruhe (TH) aufgenommen haben, können die Diplomprüfung einschließlich etwaiger Wiederholungen letztmalig bis zum 30. September 2017 ablegen.

Karlsruhe, den 04. August 2015

Professor Dr.-Ing. Holger Hanselka
(Präsident)

Karlsruher Institut für Technologie

Die Forschungsuniversität in der Helmholtz-Gemeinschaft

Amtliche Bekanntmachung

2019 **Ausgegeben Karlsruhe, den 26. Februar 2019** **Nr. 03**

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Satzung zur Änderung der Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Bachelorstudiengang Maschinenbau

vom 21. Februar 2019

Aufgrund von § 10 Absatz 2 Ziff. 5 und § 20 Absatz 2 Satz 1 des Gesetzes über das Karlsruher Institut für Technologie (KIT-Gesetz - KITG) in der Fassung vom 14. Juli 2009 (GBl. S. 317 f), zuletzt geändert durch Artikel 2 des Gesetzes zur Weiterentwicklung des Hochschulrechts (HRWeitEG) vom 13. März 2018 (GBl S. 85, 94), und § 32 Absatz 3 Satz 1 des Gesetzes über die Hochschulen in Baden-Württemberg (Landeshochschulgesetz - LHG) in der Fassung vom 1. Januar 2005 (GBl. S. 1 f), zuletzt geändert durch Artikel 1 des Gesetzes zur Weiterentwicklung des Hochschulrechts (HRWeitEG) vom 13. März 2018 (GBl. S. 85) hat der KIT-Senat am 18. Februar 2019 die folgende Satzung zur Änderung der Studien- und Prüfungsordnung für den Bachelorstudiengang Maschinenbau vom 04. August 2015 (Amtliche Bekanntmachung des Karlsruher Instituts für Technologie (KIT) Nr. 62 vom 06. August 2015) beschlossen.

Der Präsident hat seine Zustimmung gemäß § 20 Absatz 2 Satz 1 KITG i.V.m. § 32 Absatz 3 Satz 1 LHG am 21. Februar 2019 erteilt.

Artikel 1 – Änderung der Studien- und Prüfungsordnung

1. § 9 Absatz 11 werden folgende Sätze 3 und 4 angefügt:

„Die Präsentation nach § 14 Absatz 1 a ist eine Studienleistung und kann bei einer Bewertung mit „nicht bestanden (not passed)“ (im Gegensatz zu anderen Studienleistungen) nur einmal wiederholt werden. Die Präsentation ist endgültig nicht bestanden, wenn sie zweimal mit „nicht bestanden“ (not passed) bewertet wurde.“

2. § 12 Absatz 1 wird wie folgt geändert:

a) Satz 1 wird wie folgt gefasst:

„Es gelten die Vorschriften des Gesetzes zum Schutz von Müttern bei der Arbeit, in der Ausbildung und im Studium (Mutterschutzgesetz – MuSchG) in seiner jeweils geltenden Fassung.“

b) Satz 2 wird aufgehoben.

c) Die bisherigen Sätze 3 und 4 werden die Sätze 2 und 3

3. § 14 wird wie folgt geändert:

a) In Absatz 1 a Satz 2 wird nach dem Wort „Bachelorarbeit“ die Angabe „mit 12 LP“ und nach dem Wort „Präsentation“ die Angabe „mit 3 LP“ eingefügt.

b) In Absatz 2 Satz 1 werden nach den Wörtern „Hochschullehrer/innen“ das Wort “und“ durch ein Komma ersetzt und nach der Angabe „§ 14 Abs. 3 Ziff. 1 KITG“ die Wörter „und habilitierten Mitgliedern der KIT-Fakultät für Maschinenbau“ eingefügt.

c) In Absatz 7 Satz 1 werden nach den Wörtern „Hochschullehrer/innen“ das Wort “oder“ durch ein Komma ersetzt und nach der Angabe „§ 14 Abs. 3 Ziff. 1 KITG“ die Wörter „oder einem habilitierten Mitglied der KIT-Fakultät für Maschinenbau“ eingefügt.

4. § 17 wird wie folgt geändert:

a) In Absatz 1 Satz 3 wird das Wort „stammt“ durch die Wörter „stammen soll“ ersetzt.

b) In Absatz 7 Satz 4 werden nach dem Wort „Entscheidung“ die Wörter „schriftlich oder zur Niederschrift“ gestrichen.

5. § 18 Absatz 3 wird wie folgt geändert:

Nach dem Wort „sofern“ werden die Wörter „die KIT-Fakultät eine Prüfungsbefugnis erteilt hat und“ gestrichen.

6. § 26 Absatz 5 wird aufgehoben und folgender neuer Absatz 5 eingefügt:

„(5) Für Studierende, die

1. ihr Studium im Bachelorstudiengang Maschinenbau vor dem Wintersemester 2018/2019 aufgenommen haben oder
2. ihr Studium im Bachelorstudiengang Maschinenbau ab dem Wintersemester 2018/2019 in einem höheren Fachsemester aufgenommen haben bzw. aufnehmen sofern das Fachsemester über dem Jahrgang der Studienanfänger zum Wintersemester 2018/2019 liegt,

finden § 9 Abs. 11 und § 14 Abs. 1 a in der Fassung der Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Bachelorstudiengang Maschinenbau vom 04. August 2015 (Amtliche Bekanntmachung des KIT Nr. 62 vom 06. August 2015) weiterhin Anwendung.

Studierende nach Satz 1 Ziffer 1 und Ziffer 2, können das Modul Bachelorarbeit auf Grundlage der Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Bachelorstudiengang Maschinenbau in der Fassung vom 04. August 2015 (Amtliche Bekanntmachung des KIT Nr. 62 vom 06. August 2015) letztmalig bis zum 31. März 2023 ablegen“

Artikel 2 – Inkrafttreten

Diese Änderungssatzung tritt zum 01. April 2019 in Kraft.

Karlsruhe, den 21. Februar 2019

gez. Prof. Dr.-Ing. Holger Hanselka
(Präsident)