

# **Module Handbook**

## **KIT Department of Mechanical Engineering - Non-degree Studies (Domestic Degree at Another Higher Education Institution)**

SPO (none)

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KIT DEPARTMENT OF MECHANICAL ENGINEERING



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3.367. Tutorial Introduction to the Finite Element Method - T-MACH-110330 .....	546
3.368. Tutorial Mathematical Methods in Micromechanics - T-MACH-110379 .....	547
3.369. Tutorial Nonlinear Continuum Mechanics - T-MACH-111027 .....	548
3.370. Tutorial Technical Thermodynamics and Heat Transfer I - T-MACH-112910 .....	549
3.371. Vacuum and Tritium Technology in Nuclear Fusion - T-MACH-108784 .....	550
3.372. Vehicle Lightweight Design - Strategies, Concepts, Materials - T-MACH-105237 .....	551
3.373. Vehicle Systems for Urban Mobility - T-MACH-113069 .....	553
3.374. Vibration Theory - T-MACH-105290 .....	554
3.375. Virtual Engineering (Specific Topics) - T-MACH-105381 .....	556
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3.380. Water Distribution Systems - T-BGU-108486 .....	562
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3.386. Wildcard - T-MACH-112702 .....	569
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3.388. Wildcard - T-MACH-112701 .....	571
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3.391. Working Methods in Materials Science and Technology - T-MACH-100288 .....	574
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3.393. Workshop on Computer-based Flow Measurement Techniques - T-MACH-106707 .....	576



## 1 Field of study structure

Mandatory	
Courses of the KIT Department of Mechanical Engineering <i>First usage possible from Apr 01, 2023.</i>	90 CR
Courses of Other KIT Departments and Interdisciplinary Qualifications <i>First usage possible from Apr 01, 2023.</i>	90 CR

### 1.1 Courses of the KIT Department of Mechanical Engineering

**Credits**  
90

#### Note regarding usage

First usage possible from Apr 01, 2023.

The study program consists of individual bricks and an optional project, both offered by the KIT Faculty of Mechanical Engineering. In addition, further optional bricks offered by other KIT faculties can be chosen. Exchange students may select individual bricks without having to complete the entire module. Some bricks, however, may have prerequisites or possible restrictions, such as a limit on the number of participants.

Bricks should be chosen according to the Learning Agreement.

Courses of the KIT Department of Mechanical Engineering (Election: )		
M-MACH-104840	Project	30 CR
M-MACH-106250	Courses of the KIT Department of Mechanical Engineering	60 CR

### 1.2 Courses of Other KIT Departments and Interdisciplinary Qualifications

**Credits**  
90

#### Note regarding usage

First usage possible from Apr 01, 2023.

Courses of Other KIT Departments and Interdisciplinary Qualifications (Election: )		
M-MACH-106251	Courses of the KIT Department of Architecture	30 CR
M-MACH-105405	Courses of the KIT Department of Civil Engineering, Geo and Environmental Sciences	30 CR
M-MACH-106252	Courses of the KIT Department of Chemistry and Biosciences	30 CR
M-MACH-105100	Courses of the KIT Department of Chemical and Process Engineering	30 CR
M-MACH-104882	Courses of the KIT Department of Electrical Engineering and Information Technology	30 CR
M-MACH-106253	Courses of the KIT Department of Humanities and Social Sciences	30 CR
M-MACH-104883	Courses of the KIT Department of Informatics	30 CR
M-MACH-104885	Courses of the KIT Department of Mathematics	30 CR
M-MACH-106254	Courses of the KIT Department of Physics	30 CR
M-MACH-104884	Courses of the KIT Department of Economics and Management	30 CR
M-MACH-106255	Key Competencies	6 CR

## 2 Modules

### M

## 2.1 Module: Courses of the KIT Department of Architecture [M-MACH-106251]

**Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [Courses of Other KIT Departments and Interdisciplinary Qualifications](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
30	pass/fail	Each term	2 terms	German/English	4	1

### Election notes

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

Exchange Students_ARCH (Election: at most 90 credits)			
T-MACH-112696	<a href="#">Wildcard</a>	15 CR	
T-MACH-112697	<a href="#">Wildcard</a>	15 CR	

### 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.

### Prerequisites

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

### Competence Goal

The students are able to reconstruct selected topics of Architecture.

### Content

See individual bricks

**M****2.2 Module: Courses of the KIT Department of Chemical and Process Engineering [M-MACH-105100]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [Courses of Other KIT Departments and Interdisciplinary Qualifications](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
30	pass/fail	Each term	1 term	German/English	4	3

**Election notes**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

Exchange Students_CIW (Election: between 0 and 90 credits)			
T-CIWVT-108915	<a href="#">Cryogenic Engineering</a>	6 CR	Grohmann
T-CIWVT-110571	<a href="#">Design of a Jet Engine Combustion Chamber</a>	6 CR	Harth
T-CIWVT-110576	<a href="#">Energy from Biomass</a>	6 CR	Bajohr, Dahmen
T-CIWVT-111095	<a href="#">Liquid Transportation Fuels</a>	6 CR	Rauch
T-CIWVT-108873	<a href="#">Practical Course Combustion Technology</a>	4 CR	Harth

**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.

**Prerequisites**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

**Competence Goal**

The students are able to reconstruct selected topics of Chemical and Process Engineering.

**Content**

See brick courses

**Learning type**

Tutorial

**M****2.3 Module: Courses of the KIT Department of Chemistry and Biosciences [M-MACH-106252]**

**Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** [Courses of Other KIT Departments and Interdisciplinary Qualifications](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
30	pass/fail	Each term	2 terms	German/English	4	1

**Election notes**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

Exchange Students_Chembio (Election: at most 90 credits)			
T-CHEMBIO-112316	<a href="#">Batteries and Fuel Cells</a>	4 CR	Ehrenberg
T-CHEMBIO-112317	<a href="#">Hydrogen as Energy Carrier</a>	4 CR	Ehrenberg
T-MACH-112698	<a href="#">Wildcard</a>	15 CR	
T-MACH-112699	<a href="#">Wildcard</a>	15 CR	

**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.

**Prerequisites**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

**Competence Goal**

The students are able to reconstruct selected topics of Chemistry and Biosciences.

**Content**

See individual bricks

**M****2.4 Module: Courses of the KIT Department of Civil Engineering, Geo and Environmental Sciences [M-MACH-105405]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [Courses of Other KIT Departments and Interdisciplinary Qualifications](#)**Credits**  
30**Grading scale**  
pass/fail**Recurrence**  
Each term**Duration**  
1 term**Language**  
German/English**Level**  
4**Version**  
3**Election notes**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

Exchange Students_BGU (Election: )			
T-BGU-100039	<a href="#">Applied Building Physics</a>	3 CR	Altmann
T-BGU-110841	<a href="#">Fluid Mechanics of Turbulent Flows</a>	6 CR	Uhlmann
T-BGU-100040	<a href="#">Building Technology</a>	3 CR	Wirth
T-BGU-100047	<a href="#">Basics of Finite Elements</a>	5 CR	Betsch
T-BGU-109908	<a href="#">Homework 'Basics of Finite Elements'</a>	1 CR	Betsch
T-BGU-110842	<a href="#">Modeling of Turbulent Flows - RANS and LES</a>	6 CR	Uhlmann
T-BGU-108485	<a href="#">Project Report Water Distribution Systems</a>	2 CR	Oberle
T-BGU-108486	<a href="#">Water Distribution Systems</a>	4 CR	Oberle

**Competence Certificate**

Type and duration of the exam/ success control can vary according to the individually choice and is described in more detail within the individual brick.

**Prerequisites**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

**Competence Goal**

The students are able to reconstruct selected topics of Civil Engineering, Geo and Environmental Sciences.

**Content**

See individual bricks

**M****2.5 Module: Courses of the KIT Department of Economics and Management [M-MACH-104884]****Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel**Organisation:** KIT Department of Mechanical Engineering**Part of:** [Courses of Other KIT Departments and Interdisciplinary Qualifications](#)**Credits**  
30**Grading scale**  
pass/fail**Recurrence**  
Each term**Duration**  
2 terms**Language**  
German/English**Level**  
4**Version**  
3**Election notes**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

<b>Exchange Students_WIWI (Election: between 0 and 90 credits)</b>			
T-WIWI-102758	<a href="#">Introduction to Operations Research I and II</a>	9 CR	Nickel, Rebennack, Stein
T-WIWI-107501	<a href="#">Energy Market Engineering</a>	4,5 CR	Weinhardt
T-WIWI-102864	<a href="#">Entrepreneurship</a>	3 CR	Terzidis
T-WIWI-102900	<a href="#">Financial Analysis</a>	4,5 CR	Luedecke
T-WIWI-107043	<a href="#">Liberalised Power Markets</a>	5,5 CR	Fichtner
T-WIWI-102870	<a href="#">Logistics and Supply Chain Management</a>	3,5 CR	Schultmann
T-WIWI-102800	<a href="#">Management Accounting 1</a>	4,5 CR	Wouters
T-WIWI-109864	<a href="#">Product and Innovation Management</a>	3 CR	Klarmann
T-WIWI-100806	<a href="#">Renewable Energy-Resources, Technologies and Economics</a>	4 CR	Jochem
T-WIWI-102629	<a href="#">Management and Strategy</a>	3,5 CR	Lindstädt

**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.

**Prerequisites**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

**Competence Goal**

The students are able to reconstruct selected topics of Economics and Management.

**Content**

See individual bricks



**M****2.6 Module: Courses of the KIT Department of Electrical Engineering and Information Technology [M-MACH-104882]****Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel**Organisation:** KIT Department of Mechanical Engineering**Part of:** [Courses of Other KIT Departments and Interdisciplinary Qualifications](#)**Credits**  
30**Grading scale**  
pass/fail**Recurrence**  
Each term**Duration**  
2 terms**Language**  
German/English**Level**  
4**Version**  
6**Election notes**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

<b>Exchange Students_ETIT (Election: between 0 and 90 credits)</b>			
T-ETIT-101956	Bioelectric Signals	3 CR	Loewe
T-ETIT-101918	Digital Technology	6 CR	Becker
T-ETIT-103608	Electric Power Generation and Power Grid	3 CR	Hoferer
T-ETIT-110883	Electric Power Transmission & Grid Control	6 CR	Leibfried
T-ETIT-101954	Electrical Machines and Power Electronics	6 CR	Hiller
T-ETIT-101923	Electric Energy Systems	5 CR	Leibfried
T-ETIT-109318	Electronic Devices and Circuits	6 CR	Ulusoy
T-ETIT-108386	Electrical Engineering and Electronics	8 CR	De Carne
T-ETIT-109820	Electrical Engineering and Electronics	8 CR	Doppelbauer
T-ETIT-104644	Energy Storage and Network Integration	4 CR	Noe
T-ETIT-100784	Hybrid and Electric Vehicles	4 CR	Doppelbauer
T-ETIT-100772	Lighting Engineering	4 CR	Neumann
T-ETIT-113625	Medical Imaging Technology	6 CR	Spadea
T-ETIT-113607	Medical Measurement Technology	6 CR	Nahm
T-ETIT-100694	Methods of Signal Processing	6 CR	Heizmann
T-ETIT-101939	Photovoltaics	6 CR	Powalla
T-ETIT-100763	Plastic Electronics / Polymerelectronics	3 CR	Lemmer
T-ETIT-104686	Laboratory Solar Energy	6 CR	Trampert
T-ETIT-100716	Industrial Circuitry	3 CR	Liske
T-ETIT-108344	Seminar Novel Concepts for Solar Energy Harvesting	3 CR	Richards
T-ETIT-101911	Sensors	3 CR	Menesklou
T-ETIT-100774	Solar Energy	6 CR	Richards
T-ETIT-110788	Superconductors for Energy Applications	5 CR	Grilli
T-ETIT-101921	System Dynamics and Control Engineering	6 CR	Hohmann
T-ETIT-100677	Systems Engineering for Automotive Electronics	4 CR	Bortolazzi
T-ETIT-101952	Theory of Probability	5 CR	Jäkel

**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.

**Prerequisites**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

**Competence Goal**

The students are able to reconstruct selected topics of Electrical Engineering and Information Technology.

**Content**

See individual bricks

**M****2.7 Module: Courses of the KIT Department of Humanities and Social Sciences [M-MACH-106253]**

**Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** [Courses of Other KIT Departments and Interdisciplinary Qualifications](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
30	pass/fail	Each term	2 terms	German/English	4	1

**Election notes**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

Exchange Students_GeistSoz (Election: at most 90 credits)			
T-MACH-112700	<a href="#">Wildcard</a>	15 CR	
T-MACH-112701	<a href="#">Wildcard</a>	15 CR	

**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.

**Prerequisites**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

**Competence Goal**

The students are able to reconstruct selected topics of Humanities and Social Sciences.

**Content**

See individual bricks

**M****2.8 Module: Courses of the KIT Department of Informatics [M-MACH-104883]**

**Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** [Courses of Other KIT Departments and Interdisciplinary Qualifications](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
30	pass/fail	Each term	2 terms	German/English	4	3

**Election notes**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

Exchange Students_INFO (Election: between 0 and 90 credits)			
T-INFO-101377	<a href="#">Localization of Mobile Agents</a>	6 CR	Hanebeck
T-INFO-114169	<a href="#">Localization of Mobile Agents Pass</a>	0 CR	Hanebeck
T-INFO-101294	<a href="#">Mechano-Informatics and Robotics</a>	4 CR	Asfour
T-INFO-101266	<a href="#">Human-Machine-Interaction</a>	6 CR	Beigl
T-INFO-106257	<a href="#">Human-Machine-Interaction Pass</a>	0 CR	Beigl
T-INFO-101310	<a href="#">Patent Law</a>	3 CR	Werner
T-INFO-108014	<a href="#">Robotics I - Introduction to Robotics</a>	6 CR	Asfour
T-INFO-105723	<a href="#">Robotics II - Humanoid Robotics</a>	3 CR	Asfour
T-INFO-109931	<a href="#">Robotics III - Sensors and Perception in Robotics</a>	3 CR	Asfour

**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.

**Prerequisites**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

**Competence Goal**

The students are able to reconstruct selected topics of Informatics.

**Content**

See individual bricks

**M****2.9 Module: Courses of the KIT Department of Mathematics [M-MACH-104885]**

**Responsible:** Prof. Dr.-Ing. Bettina Frohnappfel  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** [Courses of Other KIT Departments and Interdisciplinary Qualifications](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
30	pass/fail	Each term	2 terms	German/English	4	2

**Election notes**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

Exchange Students_MATH (Election: between 0 and 90 credits)			
T-MATH-103323	<a href="#">Differential Equations - Exam</a>	4 CR	Grimm, Hochbruck, Neher
T-MATH-108269	<a href="#">Advanced Mathematics III Prerequisite</a>	0 CR	Aksenovich, Kühnlein
T-MATH-108270	<a href="#">Advanced Mathematics III</a>	7 CR	Aksenovich, Kühnlein
T-MATH-102242	<a href="#">Numerical Mathematics for Students of Computer Science</a>	4,5 CR	Rieder, Weiß, Wieners
T-MATH-109620	<a href="#">Probability Theory and Statistics</a>	5 CR	Bäuerle, Ebner, Fasen-Hartmann, Hug, Klar, Last, Trabs, Winter

**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.

**Prerequisites**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

**Competence Goal**

The students are able to reconstruct selected topics of Mathematics.

**Content**

See individual bricks

**M****2.10 Module: Courses of the KIT Department of Mechanical Engineering [M-MACH-106250]****Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel**Organisation:** KIT Department of Mechanical Engineering**Part of:** [Courses of the KIT Department of Mechanical Engineering](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
60	pass/fail	Each term	2 terms	German/English	3	5

KIT Department of Mechanical Engineering Courses (Election: )			
T-MACH-105173	<a href="#">Analysis of Exhaust Gas and Lubricating Oil in Combustion Engines</a>	4 CR	Gohl
T-MACH-105655	<a href="#">Alternative Powertrain for Automobiles</a>	4 CR	Noreikat
T-MACH-108847	<a href="#">Applied Mathematics in Natural Science: Flows with chemical reactions</a>	6 CR	Class
T-MACH-105215	<a href="#">Applied Tribology in Industrial Product Development</a>	4 CR	Albers, Lorentz, Matthiesen
T-MACH-105527	<a href="#">Applied Materials Simulation</a>	4 CR	Gumbsch, Schneider
T-MACH-105307	<a href="#">Drive Train of Mobile Machines</a>	4 CR	Geimer
T-MACH-105451	<a href="#">Drive Systems and Possibilities to Increase Efficiency</a>	2 CR	Kollmeier
T-MACH-105216	<a href="#">Powertrain Systems Technology B: Stationary Machinery</a>	4 CR	Düser, Ott
T-MACH-100288	<a href="#">Working Methods in Materials Science and Technology</a>	2 CR	Heilmaier
T-MACH-113412	<a href="#">Atomistic Simulations and Particle Dynamics</a>	4 CR	Gumbsch, Schneider, Weygand
T-MACH-102141	<a href="#">Constitution and Properties of Wearresistant Materials</a>	4 CR	Ulrich
T-MACH-105150	<a href="#">Constitution and Properties of Protective Coatings</a>	4 CR	Ulrich
T-MACH-105428	<a href="#">Selected Chapters of the Combustion Fundamentals</a>	4 CR	Maas
T-MACH-105462	<a href="#">Selected Problems of Applied Reactor Physics and Exercises</a>	4 CR	Dagan
T-MACH-105381	<a href="#">Virtual Engineering (Specific Topics)</a>	4 CR	Ovtcharova
T-MACH-105310	<a href="#">Design of Highly Stressed Components</a>	4 CR	Aktaa
T-MACH-105311	<a href="#">Design and Development of Mobile Machines</a>	4 CR	Geimer
T-MACH-108887	<a href="#">Design and Development of Mobile Machines - Advance</a>	0 CR	Geimer, Siebert
T-MACH-110958	<a href="#">Design and Optimization of Conventional and Electrified Automotive Transmissions</a>	4 CR	Faust
T-MACH-108844	<a href="#">Automated Manufacturing Systems</a>	8 CR	Fleischer
T-MACH-106732	<a href="#">Automated Production Systems (MEI)</a>	4 CR	Fleischer
T-MACH-106424	<a href="#">Rail System Technology</a>	4 CR	Cichon
T-MACH-110327	<a href="#">Production Operations Management</a>	3 CR	Furmans
T-MACH-110326	<a href="#">Production Operations Management-Project</a>	2 CR	Furmans
T-MACH-109933	<a href="#">Business Administration for Engineers and IT Professionals</a>	4 CR	Sebregondi
T-MACH-105184	<a href="#">Fuels and Lubricants for Combustion Engines</a>	4 CR	Kehrwald, Kubach
T-MACH-100966	<a href="#">BioMEMS - Microsystems Technologies for Life-Sciences and Medicine I</a>	4 CR	Guber
T-MACH-100967	<a href="#">BioMEMS - Microsystems Technologies for Life-Sciences and Medicine II</a>	4 CR	Guber
T-MACH-100968	<a href="#">BioMEMS - Microsystems Technologies for Life-Sciences and Medicine III</a>	4 CR	Guber
T-MACH-113976	<a href="#">Boosting the Modern Energy Landscape via Turbo Machines &amp; Machine Learning</a>	4 CR	Bauer
T-MACH-102185	<a href="#">CATIA CAD Training Course</a>	2 CR	Ovtcharova
T-MACH-102187	<a href="#">CAD-NX Training Course</a>	2 CR	Ovtcharova
T-MACH-105212	<a href="#">CAE-Workshop</a>	4 CR	Düser
T-MACH-105312	<a href="#">CATIA Advanced</a>	4 CR	Ovtcharova
T-MACH-105407	<a href="#">CFD for Power Engineering</a>	4 CR	Otic



T-MACH-105313	CFD-Lab Using OpenFOAM	4 CR	Koch
T-MACH-102169	Chemical, Physical and Material Scientific Aspects of Polymers in Microsystem Technologies	3 CR	Worgull
T-MACH-105314	Computational Intelligence	4 CR	Meisenbacher, Mikut, Reischl
T-MACH-105721	Engineer's Field of Work	2 CR	Doppelbauer, Geimer
T-MACH-105694	Data Analytics for Engineers	5 CR	Meisenbacher, Mikut, Reischl
T-MACH-113597	Decision-Making and Motion Planning for Automated Driving	6 CR	Naumann, Werling
T-MACH-112238	Holistic Approach of Managing Power Plant Operation under Uncertainty and Volatility	4 CR	Seidl
T-MACH-108407	NMR Micro Probe Hardware Conception and Construction	4 CR	Korvink
T-MACH-105540	Railways in the Transportation Market	4 CR	Cichon
T-MACH-105317	Digital Control	4 CR	Knoop
T-MACH-113016	Digitization in the Railway System	4 CR	Cichon
T-MACH-108721	Designing with Composites	4 CR	Schnack
T-MACH-105226	Dynamics of the Automotive Drive Train	4 CR	Fidlin
T-MACH-111807	Introduction to Bionics	4 CR	Hölscher
T-MACH-105320	Introduction to the Finite Element Method	3 CR	Böhlke, Langhoff
T-MACH-105525	Introduction to Nuclear Energy	4 CR	Cheng
T-MACH-105321	Introduction to Theory of Materials	4 CR	Kamlah
T-MACH-100535	Introduction into Mechatronics	6 CR	Orth, Reischl
T-MACH-105209	Introduction to Multi-Body Dynamics	5 CR	Fidlin
T-MACH-111814	Introduction to Nanotechnology	4 CR	Hölscher
T-MACH-108808	Introduction to Engineering Mechanics I: Statics	3 CR	Fidlin
T-MACH-102208	Introduction to Engineering Mechanics I: Statics and Strength of Materials	5 CR	Fidlin
T-MACH-105439	Introduction to Nonlinear Vibrations	7 CR	Fidlin
T-MACH-112215	Elasticity as a Field Theory	4 CR	Agiassofitou, Lazar
T-MACH-102211	Energy and Process Technology I	9 CR	Bauer, Maas, Schwitzke, Velji
T-MACH-102212	Energy and Process Technology II	9 CR	Maas, Schwitzke
T-MACH-105952	Energy Storage and Network Integration	4 CR	Schmidt
T-MACH-105408	Energy Systems I: Renewable Energy	4 CR	Dagan
T-MACH-105550	Energy Systems II: Reactor Physics	4 CR	Badea
T-MACH-105564	Energy Conversion and Increased Efficiency in Internal Combustion Engines	4 CR	Koch, Kubach
T-MACH-105984	Fatigue of Welded Components and Structures	3 CR	Farajian
T-MACH-105228	Organ Support Systems	4 CR	Pylatiuk
T-MACH-110945	Exercises for Materials Characterization	2 CR	Gibmeier, Schneider
T-MACH-110930	Exercises for Microstructure-Property-Relationships	2 CR	Gruber, Kirchlechner
T-MACH-105514	Experimental Dynamics	5 CR	Fidlin
T-MACH-105512	Experimental Fluid Mechanics	4 CR	Kriegseis
T-MACH-105447	Metallographic Lab Class	4 CR	Heilmaier, Kauffmann
T-MACH-102099	Experimental Lab Class in Welding Technology, in Groups	4 CR	Dietrich
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-105237	Vehicle Lightweight Design - Strategies, Concepts, Materials	4 CR	Henning
T-MACH-102207	Tires and Wheel Development for Passenger Cars	4 CR	Leister
T-MACH-105218	Automotive Vision	6 CR	Lauer, Stiller
T-MACH-113069	Vehicle Systems for Urban Mobility	4 CR	Cichon
T-MACH-105535	Composite Manufacturing - Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies	4 CR	Henning
T-MACH-105392	FEM Workshop - Constitutive Laws	4 CR	Schulz, Weygand

T-MACH-102166	Fabrication Processes in Microsystem Technology	4 CR	Bade
T-MACH-102105	Manufacturing Technology	8 CR	Schulze
T-MACH-107667	Solid State Reactions and Kinetics of Phase	4 CR	Franke, Seifert
T-MACH-105417	Finite Element Workshop	4 CR	Mattheck, Weygand
T-MACH-105474	Fluid-Structure-Interaction	4 CR	Frohnäpfel, Mühlhausen
T-MACH-102093	Fluid Power Systems	4 CR	Geimer
T-MACH-105179	Functional Ceramics	4 CR	Botros
T-MACH-110331	Nuclear Fusion Technology	4 CR	Badea
T-MACH-105411	Fusion Technology A	4 CR	Perez Martin, Weiss
T-MACH-105433	Fusion Technology B	4 CR	Perez Martin, Rieth
T-MACH-105444	Combined Cycle Power Plants	4 CR	Banuti, Schulenberg
T-MACH-105157	Foundry Technology	4 CR	Günther, Klan
T-MACH-105158	Global Production and Logistics - Part 1: Global Production	4 CR	Lanza
T-MACH-105159	Global Production and Logistics - Part 2: Global Logistics	4 CR	Furmans
T-MACH-105220	Fundamentals of Energy Technology	8 CR	Badea, Cheng
T-MACH-100092	Automotive Engineering I	8 CR	Gießler
T-MACH-102117	Automotive Engineering II	4 CR	Gießler
T-MACH-108747	Basics of Manufacturing Technology (MEI)	4 CR	Schulze
T-MACH-105379	Global Logistics	4 CR	Furmans
T-MACH-102111	Principles of Ceramic and Powder Metallurgy Processing	4 CR	Schell
T-MACH-105044	Fundamentals of Catalytic Exhaust Gas Aftertreatment	4 CR	Deutschmann, Grunwaldt, Kubach, Lox
T-MACH-105235	Principles of Medicine for Engineers	4 CR	Pylatiuk
T-MACH-104745	Basics in Measurement and Control Systems	7 CR	Stiller
T-MACH-105324	Foundations of Nonlinear Continuum Mechanics	4 CR	Kamlah
T-MACH-105530	Fundamentals of Reactor Safety for the Operation and Dismantling of Nuclear Power Plants	4 CR	Sanchez-Espinoza
T-MACH-109919	Basics of Technical Logistics I	4 CR	Mittwollen
T-MACH-109920	Basics of Technical Logistics II	6 CR	Furmans
T-MACH-105213	Fundamentals of Combustion I	4 CR	Maas
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-111389	Fundamentals in the Development of Commercial Vehicles	4 CR	Weber
T-MACH-114075	Principles of Whole Vehicle Engineering	4 CR	Harrer
T-MACH-105398	High Performance Computing	5 CR	Nestler, Selzer
T-MACH-105459	High Temperature Materials	4 CR	Heilmaier
T-MACH-114175	Human Factors Engineering I (Workplace Design)	4 CR	Deml
T-MACH-114176	Human Factors Engineering II (Organizational Design)	4 CR	Deml
T-MACH-105326	Hydraulic Fluid Machinery	8 CR	Pritz
T-MACH-112159	Hydrogen in Materials – Exercises and Lab Course	4 CR	Wagner
T-MACH-110923	Hydrogen in Materials: from Energy Storage to Hydrogen Embrittlement	4 CR	Pundt
T-MACH-105375	Industrial Aerodynamics	4 CR	Frohnäpfel, Kröber
T-MACH-105388	Introduction to Industrial Production Economics	4 CR	Dürschnabel
T-MACH-105205	Computer Science for Engineers	6 CR	Ovtcharova
T-MACH-105206	Computer Science for Engineers, Prerequisite	0 CR	Ovtcharova
T-MACH-102128	Information Systems and Supply Chain Management	3 CR	Kilger
T-MACH-112882	Innovation2Business – Innovation Strategy in the Industrial Corporate Practice	4 CR	Albers
T-MACH-105404	Innovative Nuclear Systems	4 CR	Cheng
T-MACH-109185	Innovative Project	6 CR	Class, Terzidis
T-MACH-113068	Innovation and Project Management in Rail Vehicle Engineering	4 CR	Cichon

T-MACH-105188	Integrative Strategies in Production and Development of High Performance Cars	4 CR	Schlichtenmayer
T-MACH-108849	Integrated Production Planning in the Age of Industry 4.0	8 CR	Lanza
T-MACH-114100	Introduction to Microsystem Technology I	4 CR	Badilita, Korvink
T-MACH-114101	Introduction to Microsystem Technology II	4 CR	Badilita, Korvink
T-MACH-105466	Introduction to Neutron Cross Section Theory and Nuclear Data Generation	4 CR	Dagan
T-MACH-106743	IoT Platform for Engineering	4 CR	Ovtcharova
T-MACH-100287	Introduction to Ceramics	6 CR	Schell
T-MACH-110332	Nuclear Power and Reactor Technology	4 CR	Badea
T-MACH-105402	Nuclear Power Plant Technology	4 CR	Badea, Cheng
T-MACH-105378	Cognitive Automobiles - Laboratory	6 CR	Lauer, Stiller
T-MACH-105330	Design with Plastics	4 CR	Liedel
T-MACH-100293	Structural Materials	6 CR	Guth
T-MACH-105221	Lightweight Engineering Design	4 CR	Düser, Ott
T-MACH-105786	Contact Mechanics	4 CR	Greiner
T-MACH-110377	Continuum Mechanics of Solids and Fluids	3 CR	Böhlke, Frohnäpfel
T-MACH-105222	Motor Vehicle Labor	4 CR	Frey
T-MACH-105174	Warehousing and Distribution Systems	4 CR	Furmans
T-MACH-105164	Laser in Automotive Engineering	4 CR	Schneider
T-MACH-112763	Laser Material Processing	4 CR	Schneider
T-MACH-105231	Leadership and Management Development	4 CR	Ploch
T-MACH-105331	Laboratory Exercise in Energy Technology	4 CR	Bauer, Maas, Wirbser
T-MACH-110771	Logistics and Supply Chain Management	9 CR	Furmans
T-MACH-105223	Machine Vision	8 CR	Lauer, Stiller
T-MACH-105426	Magnetohydrodynamics	4 CR	Bühler
T-MACH-105434	Magnet Technology of Fusion Reactors	4 CR	Weiss, Wolf
T-MACH-105208	Machines and Processes	7 CR	Bauer, Koch, Kubach, Pritz
T-MACH-105232	Machines and Processes, Prerequisite	0 CR	Bauer, Kubach, Maas, Pritz
T-MACH-105210	Machine Dynamics	5 CR	Proppe
T-MACH-105224	Machine Dynamics II	4 CR	Proppe
T-MACH-109082	Engineering Materials for the Energy Transition	4 CR	Seifert
T-MACH-100285	Materials Physics and Metals	13 CR	Heilmaier, Pundt
T-MACH-110946	Materials Characterization	4 CR	Gibmeier, Schneider
T-MACH-100290	Seminar in Materials Science	2 CR	Gruber, Wagner
T-MACH-114062	Mathematical Models and Methods of the Theory of Thermochemical Processes	4 CR	Bykov
T-MACH-105293	Mathematical Methods in Dynamics	6 CR	Proppe
T-MACH-110378	Mathematical Methods in Micromechanics	5 CR	Böhlke
T-MACH-105294	Mathematical Methods of Vibration Theory	6 CR	Fidlin
T-MACH-105295	Mathematical Methods in Fluid Mechanics	6 CR	Frohnäpfel, Gatti
T-MACH-113942	Mathematical Models and Methods of the Theory of Thermochemical Processes	4 CR	Bykov
T-MACH-105189	Mathematical Models and Methods for Production Systems	6 CR	Baumann, Furmans
T-MACH-103622	Measurement and Control Systems	6 CR	Stiller
T-MACH-108717	Mechanics of Laminated Composites	4 CR	Schnack
T-MACH-105333	Mechanics and Strength of Polymers	4 CR	von Bernstorff
T-MACH-105334	Mechanics in Microtechnology	4 CR	Greiner, Gruber
T-MACH-105370	Laboratory Mechatronics	4 CR	Hagenmeyer, Stiller
T-MACH-105574	Mechatronic Systems and Products	3 CR	Hohmann, Matthiesen
T-MACH-105300	Measurement Instrumentation Lab	4 CR	Merkert, Stiller
T-MACH-105468	Metals	6 CR	Heilmaier, Pundt

T-MACH-109192	Methods and Processes of PGE - Product Generation Engineering	6 CR	Albers, Burkardt, Matthiesen
T-MACH-105167	Analysis Tools for Combustion Diagnostics	4 CR	Pfeil
T-MACH-105557	Microenergy Technologies	4 CR	Kohl, Xu
T-MACH-110931	Microstructure-Property-Relationships	4 CR	Gruber, Kirchlechner
T-MACH-105782	Micro Magnetic Resonance	4 CR	Korvink, MacKinnon
T-MACH-101910	Microactuators	4 CR	Kohl
T-MACH-105303	Modelling of Microstructures	5 CR	August, Nestler
T-MACH-108383	Microsystem Simulation	4 CR	Korvink
T-MACH-105168	Mobile Machines	8 CR	Geimer
T-MACH-105297	Modeling and Simulation	7 CR	Furmans, Geimer, Kärger
T-MACH-105396	Modeling of Thermodynamical Processes	6 CR	Maas, Schießl
T-MACH-100300	Modelling and Simulation	4 CR	Gumbsch, Nestler
T-MACH-114061	Model Reduction Methods for Modeling and Simulation of Reacting Flows	4 CR	Bykov
T-MACH-105539	Modern Control Concepts I	4 CR	Groell, Matthes
T-MACH-105337	Engine Laboratory	4 CR	Wagner
T-MACH-105169	Engine Measurement Techniques	4 CR	Bernhardt
T-MACH-102152	Novel Actuators and Sensors	4 CR	Kohl, Sommer
T-MACH-111026	Nonlinear Continuum Mechanics	6 CR	Böhlke
T-MACH-105420	Numerical Simulation of Multi-Phase Flows	4 CR	Wörner
T-MACH-105397	Numerical Simulation of Turbulent Flows	4 CR	Grötzbach
T-MACH-105338	Numerical Fluid Mechanics	4 CR	Frohnepfel, Gatti
T-MACH-110838	Numerical Fluid Mechanics with PYTHON	4 CR	Frohnepfel, Gatti
T-MACH-105442	Intellectual Property Rights and Strategies in Industrial Companies	4 CR	Zacharias
T-MACH-111391	Phase Transformations in Materials	4 CR	Heilmaier, Kauffmann
T-MACH-102102	Physical Basics of Laser Technology	5 CR	Schneider
T-MACH-105537	Physical and Chemical Principles of Nuclear Energy in View of Reactor Accidents and Back-End of Nuclear Fuel Cycle	4 CR	Dagan
T-MACH-110818	Plasticity of Metals and Intermetallics	8 CR	Heilmaier, Kauffmann
T-MACH-105516	Multi-Scale Plasticity	4 CR	Greiner, Schulz
T-MACH-102137	Polymer Engineering I	4 CR	Liebig
T-MACH-102138	Polymer Engineering II	4 CR	Liebig
T-MACH-102192	Polymers in MEMS A: Chemistry, Synthesis and Applications	4 CR	Rapp
T-MACH-102191	Polymers in MEMS B: Physics, Microstructuring and Applications	4 CR	Worgull
T-MACH-102200	Polymers in MEMS C: Biopolymers and Bioplastics	4 CR	Rapp, Worgull
T-MACH-106707	Workshop on Computer-based Flow Measurement Techniques	4 CR	Bauer
T-MACH-102154	Laboratory Laser Materials Processing	4 CR	Schneider
T-MACH-105341	Lab Computer-Aided Methods for Measurement and Control	4 CR	Merkert, Stiller
T-MACH-105178	Practical Course Technical Ceramics	4 CR	Schell
T-MACH-102164	Practical Training in Basics of Microsystem Technology	4 CR	Last
T-MACH-114095	Principles of Whole Vehicle Engineering	4 CR	Harrer
T-MACH-113873	Probabilistic Measurement and Estimation	4 CR	Stiller
T-MACH-105147	Product Lifecycle Management	4 CR	Ovtcharova
T-MACH-110318	Product- and Production-Concepts for Modern Automobiles	4 CR	Kienzle, Steegmüller
T-MACH-102155	Product, Process and Resource Integration in the Automotive Industry	4 CR	Mbang
T-MACH-105383	Product Development - Dimensioning of Components	7 CR	Dietrich, Schulze
T-MACH-105346	Production Techniques Laboratory	4 CR	Deml, Fleischer, Furmans, Ovtcharova
T-MACH-105523	Productivity Management in Production Systems	4 CR	Stowasser
T-MACH-102156	Project Workshop: Automotive Engineering	6 CR	Frey, Gießler
T-MACH-105441	Development of Oil-Hydraulic Powertrain Systems	4 CR	Geerling, Geimer



T-MACH-105348	Process Simulation in Forming Operations	4 CR	Helm
T-MACH-102157	High Performance Powder Metallurgy Materials	4 CR	Schell
T-MACH-110796	Python Algorithms for Vehicle Technology	4 CR	Rhode
T-MACH-102107	Quality Management	4 CR	Lanza
T-MACH-105405	Reactor Safety I: Fundamentals	4 CR	Sanchez-Espinoza
T-MACH-105349	Computational Dynamics	4 CR	Proppe
T-MACH-105350	Computational Vehicle Dynamics	4 CR	Proppe
T-MACH-112987	Computational Continuum Mechanics	3 CR	Böhlke
T-MACH-105384	Computerized Multibody Dynamics	4 CR	Boy
T-MACH-105351	Computational Mechanics I	6 CR	Böhlke, Langhoff
T-MACH-105352	Computational Mechanics II	6 CR	Böhlke, Langhoff
T-MACH-114060	Model Reduction Methods for Modeling and Simulation of Reacting Flows	4 CR	Bykov
T-MACH-105724	Failure Analysis	4 CR	Greiner, Schneider
T-MACH-105353	Rail Vehicle Technology	4 CR	Cichon
T-MACH-105170	Welding Technology	4 CR	Farajian
T-MACH-112106	Fatigue of Materials	4 CR	Guth
T-MACH-105373	Practical Training in Measurement of Vibrations	4 CR	Fidlin
T-MACH-105171	Safety Engineering	4 CR	Kany
T-MACH-105172	Simulation of Coupled Systems	4 CR	Geimer
T-MACH-108888	Simulation of Coupled Systems - Advance	0 CR	Geimer
T-MACH-105445	Simulator Exercises Combined Cycle Power Plants	2 CR	Banuti, Schulenberg
T-MACH-105400	Scaling in Fluid Dynamics	4 CR	Bühler
T-MACH-106493	Solar Thermal Energy Systems	4 CR	Dagan
T-MACH-105372	Theory of Stability	6 CR	Fidlin
T-MACH-111821	Control of Mobile Machines	4 CR	Becker, Geimer
T-MACH-111820	Control of Mobile Machines – Prerequisites	0 CR	Becker, Geimer
T-MACH-105185	Control Technology	4 CR	Gönnheimer
T-MACH-105696	Strategic Product Development - Identification of Potentials of Innovative Products	3 CR	Siebe
T-MACH-110396	Strategic Product Development - Identification of Potentials of Innovative Products - Case Study	1 CR	Albers, Matthiesen, Siebe
T-MACH-105422	Flows with Chemical Reactions	4 CR	Class
T-MACH-105403	Flows and Heat Transfer in Energy Technology	4 CR	Cheng
T-MACH-105970	Structural Analysis of Composite Laminates	4 CR	Kärger
T-MACH-102103	Superhard Thin Film Materials	4 CR	Ulrich
T-MACH-114033	Sustainable Product Engineering: Sustainable Product Design - Long-term Business Success with Sustainably Developed Products	4 CR	Ziegahn
T-MACH-100531	Systematic Materials Selection	4 CR	Dietrich, Schulze
T-MACH-105555	System Integration in Micro- and Nanotechnology	4 CR	Gengenbach
T-MACH-110272	System Integration in Micro- and Nanotechnology 2	4 CR	Gengenbach
T-MACH-105559	Technical Energy Systems for Buildings 1: Processes & Components	4 CR	Schmidt
T-MACH-105560	Technical Energy Systems for Buildings 2: System Concept	4 CR	Schmidt
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-100283	Engineering Mechanics II	6 CR	Böhlke, Langhoff
T-MACH-112906	Engineering Mechanics III	6 CR	Proppe
T-MACH-105290	Vibration Theory	4 CR	Fidlin
T-MACH-105361	Technical Design in Product Development	4 CR	Albers, Matthiesen, Schmid
T-MACH-112912	Technical Thermodynamics and Heat Transfer I	6 CR	Maas
T-MACH-105362	Technology of Steel Components	4 CR	Schulze
T-MACH-105456	Ten Lectures on Turbulence	4 CR	Otic

T-MACH-105363	Thermal Turbomachines I	6 CR	Bauer
T-MACH-105364	Thermal Turbomachines II	6 CR	Bauer
T-MACH-106372	Thermal-Fluid-Dynamics	4 CR	Ruck
T-MACH-105554	Thin Film and Small-scale Mechanical Behavior	4 CR	Gruber, Kirchlechner, Weygand
T-MACH-105423	Tractors	4 CR	Geimer, Kremmer
T-MACH-105531	Tribology	8 CR	Dienwiebel, Scherge
T-MACH-111027	Tutorial Nonlinear Continuum Mechanics	2 CR	Böhlke
T-MACH-109304	Excercises - Fatigue of Welded Components and Structures	1 CR	Farajian
T-MACH-109303	Excercises - Tribology	0 CR	Dienwiebel
T-MACH-107671	Exercises for Applied Materials Simulation	2 CR	Gumbsch, Schneider
T-MACH-110330	Tutorial Introduction to the Finite Element Method	1 CR	Böhlke, Langhoff
T-MACH-107632	Exercises for Solid State Reactions and Kinetics of Phase Transformations	2 CR	Franke, Seifert
T-MACH-110333	Tutorial Continuum Mechanics of Solids and Fluids	1 CR	Böhlke, Frohnäpfel
T-MACH-110379	Tutorial Mathematical Methods in Micromechanics	1 CR	Böhlke
T-MACH-112996	Tutorial Computational Continuum Mechanics	1 CR	Böhlke
T-MACH-100284	Tutorial Engineering Mechanics II	0 CR	Böhlke, Langhoff
T-MACH-112909	Tutorial Engineering Mechanics III	1 CR	N.N., Proppe
T-MACH-112910	Tutorial Technical Thermodynamics and Heat Transfer I	1 CR	Maas
T-MACH-107685	Exercises for Materials Characterization	2 CR	Gibmeier, Schneider
T-MACH-105177	Metal Forming	4 CR	Herlan
T-MACH-108784	Vacuum and Tritium Technology in Nuclear Fusion	4 CR	Giegerich, Größle
T-MACH-102194	Combustion Engines I	4 CR	Koch, Kubach
T-MACH-104609	Combustion Engines II	5 CR	Koch, Kubach
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-102148	Gear Cutting Technology	4 CR	Klaiber
T-MACH-102123	Virtual Engineering I	4 CR	Ovtcharova
T-MACH-102124	Virtual Engineering II	4 CR	Ovtcharova
T-MACH-102149	Virtual Reality Practical Course	4 CR	Ovtcharova
T-MACH-105292	Heat and Mass Transfer	4 CR	Maas, Yu
T-MACH-105430	Heatpumps	4 CR	Maas, Wirbser
T-MACH-105529	Heat Transfer in Nuclear Reactors	4 CR	Cheng
T-MACH-113362	Heat Transfer and Cooling at Thermally Highly Loaded Components	4 CR	Bauer, Schmid
T-MACH-105416	Hydrogen Technologies	4 CR	Jedicke, Jordan
T-MACH-107684	Materials Characterization	4 CR	Gibmeier, Schneider
T-MACH-105211	Materials of Lightweight Construction	4 CR	Liebig
T-MACH-105301	Materials Science and Engineering III	8 CR	Heilmaier
T-MACH-105369	Materials Modelling: Dislocation Based Plasticity	4 CR	Weygand
T-MACH-100295	Materials Processing Technology	6 CR	Binder, Liebig
T-MACH-110962	Machine Tools and High-Precision Manufacturing Systems	8 CR	Fleischer
T-MACH-105234	Windpower	4 CR	Lewald
T-MACH-108680	Workshop Mechatronical Systems and Products	4 CR	Hohmann, Matthiesen



**M****2.11 Module: Courses of the KIT Department of Physics [M-MACH-106254]**

**Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** [Courses of Other KIT Departments and Interdisciplinary Qualifications](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
30	pass/fail	Each term	2 terms	German/English	4	1

**Election notes**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

Exchange Students_Physics (Election: at most 90 credits)			
T-MACH-112702	<a href="#">Wildcard</a>	15 CR	
T-MACH-112703	<a href="#">Wildcard</a>	15 CR	

**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.

**Prerequisites**

Exchange students are allowed to choose bricks from this module. There may be prerequisites or restrictions, for instance regarding the number of places for individual courses. Exchange students do not need to choose the whole module, but can select individual bricks.

**Competence Goal**

The students are able to reconstruct selected topics of Physics.

**Content**

See individual bricks

**M****2.12 Module: Key Competencies [M-MACH-106255]****Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel**Organisation:** KIT Department of Mechanical Engineering**Part of:** [Courses of Other KIT Departments and Interdisciplinary Qualifications](#)**Credits**  
6**Grading scale**  
pass/fail**Recurrence**  
Each term**Duration**  
1 term**Language**  
German/English**Level**  
4**Version**  
1**Election notes**

Interdisciplinary qualifications (IQ) completed at the House of Competence (HoC), at the Zentrum für Angewandte Kulturwissenschaft und Studium Generale (ZAK), or at the Sprachenzentrum (SpZ), can be assigned in self-service.

First, select a partial accomplishment named "self-assignment" in your study schedule, and second, assign an IQ-achievement via the tab "IQ achievements".

Key Competencies (Election: )			
T-MACH-111686	<a href="#">Self-Booking-MSc-HOC-SPZ-FORUM-Non-Graded</a>	2 CR	Frohnäpfel
T-MACH-111687	<a href="#">Self-Booking-MSc-HOC-SPZ-FORUM-Graded</a>	2 CR	Frohnäpfel

**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.

**Prerequisites**

none

**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 the principles of safeguarding good scientific practice,
- 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.

**Content**

The module Key Competences consists of freely selectable courses offered by the KIT-House of Competence (HoC), the Sprachenzentren (SpZ), the Zentren für Angewandte Kulturwissenschaft und Studium Generale (ZAK), and the brick courses contained in the elective block of key qualifications with a work load corresponding to a total of at least 2 ECTS. Upon request, the examination board may approve further courses as freely selectable subjects in the module "Key Competences".

**Module grade calculation**

Certification without grade

**Annotation**

Only HoC/SPZ/ZAK courses and courses from the "Compulsory-elective block Key Competences" can be chosen.

**Learning type**

lectures, seminars, tutorials, lab courses.

**M****2.13 Module: Project [M-MACH-104840]****Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel**Organisation:** KIT Department of Mechanical Engineering**Part of:** [Courses of the KIT Department of Mechanical Engineering](#)**Credits**  
30**Grading scale**  
Grade to a tenth**Recurrence**  
Each term**Duration**  
1 term**Language**  
German/English**Level**  
5**Version**  
1

Project (Election: at most 1 item)			
T-MACH-109880	<a href="#">Thesis (MSc)</a>	30 CR	Frohnäpfel
T-MACH-110107	<a href="#">Thesis (BSc)</a>	15 CR	Frohnäpfel
T-MACH-110106	<a href="#">Project work</a>	20 CR	Frohnäpfel

**Competence Certificate**

The module Project consists of a written report of a scientific subject chosen by the student himself/herself or given by the supervisor. The Project work 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.

**Prerequisites**

none

**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 independently, 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 the given scientific question, is able to choose sophisticated scientific methods and techniques, and use them to solve this question and to identify further potentials, respectively. In addition, this will be carried out in consideration of social and/or ethical aspects.

**Content**

The student shall be allowed to make suggestions for the topic of his/her Project work.

**Workload**

Maximum: 900 hours.

### 3 Courses

#### T

### 3.1 Course: Advanced Mathematics III [T-MATH-108270]

**Responsible:** Prof. Dr. Maria Aksenovich  
PD Dr. Stefan Kühnlein

**Organisation:** KIT Department of Mathematics

**Part of:** [M-MACH-104885 - Courses of the KIT Department of Mathematics](#)

**Type**  
Written examination

**Credits**  
7

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 24/25	0160000	<a href="#">Advanced Mathematics III (Lecture)</a>	4 SWS	Lecture	Thäter
Exams					
WT 24/25	7700116	<a href="#">Advanced Mathematics III</a>			Link, Thäter

#### Competence Certificate

Assessment is carried out in form of a written examinations of 120 minutes length.

#### Prerequisites

Passing scores for homework are prerequisites for the examination.

#### Modeled Conditions

The following conditions have to be fulfilled:

1. The course [T-MATH-108269 - Advanced Mathematics III Prerequisite](#) must have been passed.

## T

**3.2 Course: Advanced Mathematics III Prerequisite [T-MATH-108269]**

**Responsible:** Prof. Dr. Maria Aksenovich  
PD Dr. Stefan Kühnlein

**Organisation:** KIT Department of Mathematics

**Part of:** [M-MACH-104885 - Courses of the KIT Department of Mathematics](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (written)	0	pass/fail	Each winter term	1

Events					
WT 24/25	0170000	<a href="#">Advanced Mathematics III (Tutorial)</a>	2 SWS	Practice	Thäter
Exams					
WT 24/25	7700132	<a href="#">Advanced Mathematics III Prerequisite</a>			Thäter

**Competence Certificate**


Assessment is carried out based on written homework assignments. Exact requirements will be detailed in class.





**Prerequisites**

None.

## T

**3.3 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Written examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2133132	<a href="#">Sustainable Vehicle Drivetrains</a>	2 SWS	Lecture / 	Toedter
Exams					
WT 24/25	76-T-MACH-105655	<a href="#">Sustainable Vehicle Drivetrains</a>	Toedter		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam

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

## V

**Sustainable Vehicle Drivetrains**2133132, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

Sustainability

Environmental balance

Legislation

Alternative fuels

BEV

Fuel cell

Hybrid drives



## T

**3.4 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type
Oral examination

Credits
4

Grading scale
Grade to a third

Recurrence
Each summer term

Version
1

Exams			
WT 24/25	76-T-MACH-105173	<a href="#">Analysis of Exhaust Gas and Lubricating Oil in Combustion Engines</a>	Gohl, Koch

**Competence Certificate**

Oral examination, duration approx. 25 min, no aids

**Prerequisites**

none

**Workload**

120 hours

## T

**3.5 Course: Analysis Tools for Combustion Diagnostics [T-MACH-105167]****Responsible:** Jürgen Pfeil**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Exams				
WT 24/25	76-T-MACH-105167	<a href="#">Analysis Tools for Combustion Diagnostics</a>		Koch

**Competence Certificate**

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


**Prerequisites**




none

## T

## 3.6 Course: Applied Building Physics [T-BGU-100039]

**Responsible:** Frank Altmann**Organisation:** KIT Department of Civil Engineering, Geo and Environmental Sciences**Part of:** [M-MACH-105405 - Courses of the KIT Department of Civil Engineering, Geo and Environmental Sciences](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
3

Events					
WT 24/25	6211909	<a href="#">Angewandte Bauphysik</a>	2 SWS	Lecture / 	Vogel, Dehn, Altmann
Exams					
WT 24/25	8241100039	<a href="#">Applied Building Physics</a>	Dehn		

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**Workload**

90 hours

## T


## 3.7 Course: Applied Materials Simulation [T-MACH-105527]





**Responsible:** Prof. Dr. Peter Gumbsch  
Dr.-Ing. Johannes Schneider

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	3

Events					
ST 2025	2182614	<a href="#">Applied Materials Simulation</a>	4 SWS	Lecture / Practice ( / ) 	Gumbsch
Exams					
WT 24/25	76-T-MACH-105527	<a href="#">Applied Materials Modelling</a>			Gumbsch, Schulz

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

oral exam ca. 30 minutes

no tools or reference materials

### Prerequisites

The successful participation in Übungen zu Angewandte Werkstoffsimulation is the condition for the admittance to the oral exam in Angewandte Werkstoffsimulation.

T-MACH-110928 – Exercises for Applied Materials Simulation has not been started.

T-MACH-110929 – Applied Materials Modelling has not been started.

### Modeled Conditions

The following conditions have to be fulfilled:

1. The course [T-MACH-107671 - Exercises for Applied Materials Simulation](#) must have been passed.

### Workload

120 hours

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

## V

## Applied Materials Simulation

2182614, SS 2025, 4 SWS, Language: German, [Open in study portal](#)

Lecture / Practice (VÜ)  
Online

**Content**

This lecture should give the students an overview of different simulation methods in the field of materials science and engineering. Numerical methods are presented and their use in different fields of application and size scales shown and discussed. On the basis of theoretical as well as practical aspects, a critical examination of the opportunities and challenges of numerical material simulation shall be carried out.

The student can

- define different numerical methods and distinguish their range of application
- approach issues by applying the finite element method and discuss the processes and results
- understand complex processes of metal forming and crash simulation and discuss the structural and material behavior
- define and apply the physical fundamentals of particle-based simulation techniques to applications of materials science
- illustrate the range of application of atomistic simulation methods and distinguish between different models

preliminary knowledge in mathematics, physics and materials science recommended

regular attendance: 34 hours

exercise: 11 hours

self-study: 165 hours

oral exam ca. 35 minutes

no tools or reference materials

admission to the exam only with successful completion of the exercises

**Organizational issues**

Die Vorlesung wird nur als Aufzeichnung angeboten!

Bitte besuchen Sie die englischsprachige Veranstaltung "Applied Materials Simulation" (2182616)!

Weitere Informationen finden Sie in ILIAS.

Kontakt: johannes.schneider@kit.edu

**Literature**

1. D. Frenkel, B. Smit: Understanding Molecular Simulation: From Algorithms to Applications, Academic Press, 2001
2. W. Kurz, D.J. Fisher: Fundamentals of Solidification, Trans Tech Publications, 1998
3. P. Haupt: Continuum Mechanics and Theory of Materials, Springer, 1999
4. M. P. Allen, D. J. Tildesley: Computer simulation of liquids, Clarendon Press, 1996

## T


### 3.8 Course: Applied Mathematics in Natural Science: Flows with chemical reactions [T-MACH-108847]





**Responsible:** apl. Prof. Dr. Andreas Class

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (oral)	6	pass/fail	Each winter term	1

Events					
WT 24/25	2153406	<a href="#">Flows with chemical reactions</a>	2 SWS	Lecture / 	Class
Exams					
WT 24/25	76-T-MACH-105422	<a href="#">Flows with Chemical Reactions</a>			Class

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

#### Competence Certificate

The study performance is considered to have been passed if all exercise assignments have been successfully processed and the final colloquium (30 minutes) has been successfully passed.

no auxiliary mean

#### Prerequisites

none

#### Recommendation

Fluid Mechanics (T-MACH-105207)

Mathematical Methods in Fluid Mechanics (T-MACH-105295)

#### Workload

180 hours

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

## V

### Flows with chemical reactions

2153406, WS 24/25, 2 SWS, Language: German/English, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**

#### Content

The students can describe flow scenarios, where a chemical reaction is confined to a thin layer. They can choose simplifying approaches for the underlying chemistry and discuss the problems with focus on the fluid mechanic aspects. The students are able to solve simple problems analytically. Furthermore, they are qualified to discuss simplifications as relevant for an efficient numerical solution of complex problems.

In the lecture we mainly consider problems, where chemical reaction is confined to a thin layer.

The problems are solved analytically or they are at least simplified allowing for efficient numerical

solution procedures. We apply simplified chemistry and focus on the fluid mechanic aspects of the problems.

#### Literature

Vorlesungsskript

Buckmaster, J.D.; Ludford, G.S.S.: Lectures on Mathematical Combustion, SIAM 1983

**T****3.9 Course: Applied Tribology in Industrial Product Development [T-MACH-105215]**

**Responsible:** Prof. Dr.-Ing. Albert Albers  
Dr.-Ing. Benoit Lorentz  
Prof. Dr.-Ing. Sven Matthiesen

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type
Oral examination

Credits
4

Grading scale
Grade to a third

Recurrence
Each winter term

Version
2

**Competence Certificate**

oral exam (20 min)

**Prerequisites**

None

**Workload**

120 hours

## T

**3.10 Course: Atomistic Simulations and Particle Dynamics [T-MACH-113412]**

**Responsible:** Prof. Dr. Peter Gumbsch  
Dr.-Ing. Johannes Schneider  
Dr. Daniel Weygand

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2181740	<a href="#">Particle Dynamics and Atomistic Simulation</a>	3 SWS	Lecture / Practice ( / )	Weygand, Gumbsch

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam ca. 30 minutes

**Prerequisites**

none

**Recommendation**

preliminary knowledge in mathematics, physics and materials science

**Workload**

120 hours

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

## V

**Particle Dynamics and Atomistic Simulation**

2181740, SS 2025, 3 SWS, Language: English, [Open in study portal](#)

**Lecture / Practice (VÜ)  
On-Site**



## Content

Particle-based methods are numerical techniques used to simulate and analyse systems consisting of many discrete particles. They are particularly useful in fields where traditional continuum mechanical approaches are insufficient, such as granular materials, complex fluids, and defects in solids. In the lecture, the Discrete Element Method (DEM) for particles and Molecular Dynamics (MD) for the atomistic description of material behaviour will be covered. These methods span different length and time scales.

1. Introduction to Particle-Based Methods
  - a) origin and application
  - b) classification of particle-based methods
2. Fundamentals of Particle Dynamics
  - a) Newtonian mechanics and conservation laws
  - b) contact mechanics and friction laws
  - c) kinematics and dynamics of particles
3. Discrete Element Method (DEM)
  - a) principles and fundamentals
  - b) numerical implementation: discretizing space and time
  - c) particle detection and contact modelling
  - d) application examples
4. Atomistic Methods: Molecular Dynamics (MD) and Statics (MS)
  - a) fundamentals of atomistic models
  - b) interaction: interatomic potentials
    - i. pair potentials and their limits
    - ii. many-body potentials
  - c) integration methods (e.g., Verlet, Leap-Frog)
  - d) periodic boundary conditions and neighbour lists
  - e) applications in materials science
5. Structural Analysis:
  - a) classification of neighbourhoods, distribution functions
  - b) defect energy
  - c) stresses, strains
6. Statistical Aspects of Atomistic Models
  - a) phase space
  - b) physical ensembles: microcanonical, canonical, grand canonical
  - c) control of temperature, pressure, stresses: thermostats and barostats
  - d) fluctuations and physical properties

The lecture covers both fundamental and advanced aspects of particle-based methods, with a particular focus on simple atomistic approaches. The accompanying computer exercises are designed to deepen and complement the lecture content through practical examples using the freely available particle simulation tool "LAMMPS" and to serve as a forum for detailed questions from students.

**Objective:** The student will be able to

- explain the physical principles of particle-based simulations,
- describe the application areas of particle-based simulation methods,
- apply particle-based simulation methods to address problems in materials science, materials engineering, and process engineering.

Recommended Prerequisites: mathematics, physics, and materials science

Lecture: 22.5 hours

Exercises: 12 hours

Self-study: 85.5 hours

**Oral exam:** approximately 30 minutes

## Organizational issues

Die Vorlesung wird auf Englisch angeboten!

## Literature

1. Understanding Molecular Simulation: From Algorithms to Applications, Daan Frenkel and Berend Smit (Academic Press, 2001) wie alle guten MD Bücher stark aus dem Bereich der physikalischen Chemie motiviert und auch aus diesem Bereich mit Anwendungsbeispielen gefüllt, trotzdem für mich das beste Buch zum Thema!
2. Computer simulation of liquids, M. P. Allen and Dominic J. Tildesley (Clarendon Press, Oxford, 1996) Immer noch der Klassiker zu klassischen MD Anwendungen. Weniger stark im Bereich der Nichtgleichgewichts-MD.
3. Computational Granular Dynamics. T. Pöschel, T. Schwager, Springer, 2005. Diskrete Element Methoden.
4. Lecture Slides and Exercises.

## 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	8	Grade to a third	Each summer term	1

Exams				
WT 24/25	76-T-MACH-108844	<a href="#">Automated Manufacturing Systems</a>		Fleischer

**Competence Certificate**

oral exam (40 minutes)

**Prerequisites**


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





**Workload**

240 hours

## 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
2

Events					
ST 2025	3150012	<a href="#">Automated Production Systems</a>	2 SWS	Lecture / 	Fleischer
Exams					
WT 24/25	76-T-MACH-106732	<a href="#">Automated Production Systems (MEI)</a>			Fleischer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam (approx. 20 min)

**Prerequisites**

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

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

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-108844 - Automated Manufacturing Systems](#) must not have been started.

**Workload**

120 hours

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

## V

**Automated Production Systems**3150012, SS 2025, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**On-Site****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.

**Learning Outcomes:**

The students ...

- are able to analyze implemented automated manufacturing systems and describe their components.
- are capable to assess the implemented examples of implemented automated manufacturing systems and apply them to new problems.
- are able to name automation tasks in manufacturing plants and name the components which are necessary for the implementation of each automation task.



**Organizational issues**

Die genauen Termine und Raum werden über die wbk-Homepage bekannt gegeben.

## T

**3.13 Course: Automotive Engineering I [T-MACH-100092]****Responsible:** Dr.-Ing. Martin Gießler**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Language	Version
Written examination	8	Grade to a third	Each winter term	1 terms		3

Events					
WT 24/25	2113805	<a href="#">Automotive Engineering I</a>	4 SWS	Lecture / 	Gießler
WT 24/25	2113809	<a href="#">Automotive Engineering I</a>	4 SWS	Lecture / 	Gießler
Exams					
WT 24/25	76-T-MACH-100092	<a href="#">Automotive Engineering</a>			Gießler
ST 2025	76-T-MACH-100092	<a href="#">Automotive Engineering</a>			Gießler

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**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.

**Workload**

240 hours

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

## V

**Automotive Engineering I**2113805, WS 24/25, 4 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****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

**Learning Objectives:**

The students know the movements and the forces at the vehicle and are familiar with active and passive safety. They have proper knowledge about operation of engines and alternative drives, the necessary transmission between engine and drive wheels and the power distribution. They have an overview of the components necessary for the drive and have the basic knowledge, to analyze, to evaluate, and to develop the complex system "vehicle".

**Organizational issues**

Das Vorlesungsmaterial wird auf ILIAS bereitgestellt. Das ILIAS-Passwort erhalten Sie unter <https://fast-web-01.fast.kit.edu/Passwoerterllias/>

Kann nicht mit der Veranstaltung [2113809] kombiniert werden.

Can not be combined with lecture [2113809].

**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.: Skriptum zur Vorlesung "Grundlagen der Fahrzeugtechnik I", KIT, Institut für Fahrzeugsystemtechnik, Karlsruhe, jährlich aktualisiert

**Automotive Engineering I**

2113809, WS 24/25, 4 SWS, Language: English, [Open in study portal](#)

**Lecture (V)  
On-Site**

**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

Learning Objectives:

The students know the movements and the forces at the vehicle and are familiar with active and passive safety. They have proper knowledge about operation of engines and alternative drives, the necessary transmission between engine and drive wheels and the power distribution. They have an overview of the components necessary for the drive and have the basic knowledge, to analyze, to evaluate, and to develop the complex system "vehicle".

**Organizational issues**

You will find the lecture material on ILIAS. To get the ILIAS password, KIT students refer to <https://fast-web-01.fast.kit.edu/Passwoerterllias/>, students from eucor universities send an e-mail to [martina.kaiser@kit.edu](mailto:martina.kaiser@kit.edu)

Kann nicht mit LV Grundlagen der Fahrzeugtechnik I [2113805] kombiniert werden.

Can not be combined with lecture [2113805] Grundlagen der Fahrzeugtechnik I.

**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.: Skriptum zur Vorlesung 'Automotive Engineering I', KIT, Institut für Fahrzeugsystemtechnik, Karlsruhe, jährlich aktualisiert

## T

**3.14 Course: Automotive Engineering II [T-MACH-102117]****Responsible:** Dr.-Ing. Martin Gießler**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2114835	<a href="#">Automotive Engineering II</a>	2 SWS	Lecture / 	Gießler
ST 2025	2114855	<a href="#">Automotive Engineering II</a>	2 SWS	Lecture / 	Gießler
Exams					
WT 24/25	76-T-MACH-102117	<a href="#">Automotive Engineering II</a>			Gießler
WT 24/25	76T-MACH-102117-2	<a href="#">Automotive Engineering II</a>			Gießler
ST 2025	76-T-MACH-102117	<a href="#">Automotive Engineering II</a>			Gießler

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Written Examination

Duration: 90 minutes

Auxiliary means: none

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Automotive Engineering II**2114835, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****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

Learning Objectives:

The students have an overview of the modules which are necessary for the tracking of a motor vehicle and the power transmission between vehicle bodywork and roadway. They have knowledge of different wheel suspensions, tyres, steering elements, and brakes. They know different design versions, functions and the influence on driving and braking behavior. They are able to correctly develop the appropriate components. They are ready to analyze, to evaluate, and to optimize the complex interaction of the different components under consideration of boundary conditions.

**Organizational issues**

Kann nicht mit der Veranstaltung [2114855] kombiniert werden.

Can not be combined with lecture [2114855]

**Literature**

1. Heiing, 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. Unrau, H.-J. / Gnadler, R.: Skriptum zur Vorlesung 'Grundlagen der Fahrzeugtechnik II', KIT, Institut fr Fahrzeugsystemtechnik, Karlsruhe, jhrliche Aktualisierung

**Automotive Engineering II**2114855, SS 2025, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)  
On-Site****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 the designs

**Learning Objectives:**

The students have an overview of the modules which are necessary for the tracking of a motor vehicle and the power transmission between vehicle and roadway. They have knowledge of different wheel suspensions, tyres, steering elements, and brakes. They know different design versions, functions and the influence on driving and braking behavior. They are able to correctly develop the appropriate components. They are ready to analyze, to evaluate, and to optimize the complex interaction of the different components under consideration of boundary conditions.

**Literature****Elective literature:**

1. Robert Bosch GmbH: Automotive Handbook, 9th Edition, Wiley, Chichester 2015
2. Heiing, B. / Ersoy, M.: Chassis Handbook - fundamentals, driving dynamics, components, mechatronics, perspectives, Vieweg+Teubner, Wiesbaden 2011
3. Gieler, M. / Gnadler, R.: Script to the lecture "Automotive Engineering II", KIT, Institut of Vehicle System Technology, Karlsruhe, annual update



## T


**3.15 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each summer term	3

Events					
ST 2025	2138340	<a href="#">Automotive Vision</a>	3 SWS	Lecture / 	Lauer, Bätz
Exams					
WT 24/25	76-T-MACH-105218	<a href="#">Automotive Vision</a>			Stiller, Lauer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Type of Examination: written exam

Duration of Examination: 60 minutes

**Prerequisites**

none

**Workload**

180 hours

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

## V

**Automotive Vision**

2138340, SS 2025, 3 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content****Lernziele (EN):**

Machine perception and interpretation of the environment for the basis for the generation of intelligent behaviour. Especially visual perception opens the door to novel automotive applications. First driver assistance systems can already improve safety, comfort and efficiency in vehicles. Yet, several decades of research will be required to achieve an automated behaviour with a performance equivalent to a human operator. The lecture addresses students in mechanical engineering and related subjects who intend to get an interdisciplinary knowledge in a state-of-the-art technical domain. Machine vision, vehicle kinematics and advanced information processing techniques are presented to provide a broad overview on 'Seeing vehicles'. Application examples from cutting-edge and future driver assistance systems illustrate the discussed subjects.

**Lehrinhalt (EN):**

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

Nachweis: Written examination 60 minutes

Arbeitsaufwand (EN): 120 hours





**Literature**





Foliensatz zur Veranstaltung wird als kostenlose pdf-Datei bereitgestellt. Weitere Empfehlungen werden in der Vorlesung bekannt gegeben.

## T

## 3.16 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Written examination**Credits**  
7**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
3

Events					
WT 24/25	2137301	<a href="#">Measurement and Control Systems</a>	3 SWS	Lecture / 	Stiller
WT 24/25	2137302	<a href="#">Measurement and Control Systems (Tutorial)</a>	1 SWS	Practice / 	Stiller
WT 24/25	3137020	<a href="#">Measurement and Control Systems</a>	3 SWS	Lecture / 	Stiller
WT 24/25	3137021	<a href="#">Measurement and Control Systems (Tutorial)</a>	1 SWS	Practice / 	Stiller
Exams					
WT 24/25	76-T-MACH-104745	<a href="#">Basis of Measurement and Control Systems</a>	Stiller		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam

2,5 hours

**Prerequisites**

none

**Workload**

210 hours

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

## V

**Measurement and Control Systems**2137301, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site**

**Content****Lehrinhalt (EN):**

- 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

**Lernziele (EN):**

Measurement and control of physical entities is a vital requirement in most technical applications. Such entities may comprise e.g. pressure, temperature, flow, rotational speed, power, voltage and electrical current, etc.. From a general perspective, the objective of measurement is to obtain information about the state of a system while control aims to influence the state of a system in a desired manner. This lecture provides an introduction to this field and general systems theory. The control part of the lecture presents classical linear control theory. The measurement part discusses electrical measurement of non-electrical entities.

**Voraussetzungen (EN)**

Fundamentals in physics and electrical engineering; ordinary linear differential equations; Laplace transform

**Nachweis (EN)**

written exam; duration 2,5 h; paper reference materials only (no calculator)

**Arbeitsaufwand (EN):**

210 hours

**Organizational issues**

Die Vorlesung startet am 23.10.2024.

**Literature**

Buch zur Vorlesung:

C. Stiller: Grundlagen der Mess- und Regelungstechnik, Shaker Verlag, Aachen, 2005

- 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

**Measurement and Control Systems**

3137020, WS 24/25, 3 SWS, Language: English, [Open in study portal](#)

**Lecture (V)  
On-Site**

**Content****Lehrinhalt (EN):**

- 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

**Lernhziele (EN):**

Measurement and control of physical entities is a vital requirement in most technical applications. Such entities may comprise e.g. pressure, temperature, flow, rotational speed, power, voltage and electrical current, etc.. From a general perspective, the objective of measurement is to obtain information about the state of a system while control aims to influence the state of a system in a desired manner. This lecture provides an introduction to this field and general systems theory. The control part of the lecture presents classical linear control theory. The measurement part discusses electrical measurement of non-electrical entities.

Nachweis (EN): written exam; duration 2,5 h; paper reference materials only (no calculator)

Arbeitsaufwand (EN): 180 hours

**Organizational issues**

Die Vorlesung startet am 22.10.2024.

**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. Schröder: 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

**Measurement and Control Systems (Tutorial)**

3137021, WS 24/25, 1 SWS, Language: English, [Open in study portal](#)

**Practice (Ü)  
On-Site**



**Content**





Tutorial for Measurement and Control Systems

## T

## 3.17 Course: Basics of Finite Elements [T-BGU-100047]

**Responsible:** Prof. Dr.-Ing. Peter Betsch**Organisation:** KIT Department of Civil Engineering, Geo and Environmental Sciences**Part of:** [M-MACH-105405 - Courses of the KIT Department of Civil Engineering, Geo and Environmental Sciences](#)**Type**  
Oral examination**Credits**  
5**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
WT 24/25	6215901	<a href="#">Grundlagen Finite Elemente</a>	2 SWS	Lecture / 	Franke
WT 24/25	6215902	<a href="#">Übungen zu Grundlagen Finite Elemente</a>	2 SWS	Practice / 	Reiff
Exams					
WT 24/25	8243100047	<a href="#">Fundamentals of Finite Elements</a>	Betsch		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**Workload**

150 hours

**T****3.18 Course: Basics of Manufacturing Technology (MEI) [T-MACH-108747]**

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

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Written examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	3118092	<a href="#">Basics of Manufacturing Technology</a>	2 SWS	Lecture / 	Schulze
Exams					
WT 24/25	76-T-MACH-108747	<a href="#">Basics of Manufacturing Technology (MEI)</a>	Schulze		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam (duration: 60 min)

**Prerequisites**

none

**Workload**

120 hours

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

**V****Basics of Manufacturing Technology**

3118092, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**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

**Learning Outcomes:**

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.

**Workload:**

regular attendance: 21 hours

self-study: 99 hours

**Organizational issues**

Vorlesungstermine, Vorlesungsunterlagen und weitere Informationen werden über Ilias bekannt gegeben.

The lecture notes and further information on organisation of the lecture will be available on ILIAS.

**Literature****Medien:**

Skript zur Veranstaltung wird über ilias (<https://ilias.studium.kit.edu/>) bereitgestellt.

**Media:**

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





### 3.19 Course: Basics of Technical Logistics I [T-MACH-109919]

**Responsible:** Dr.-Ing. Martin Mittwollen

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Written examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	2117095	<a href="#">Basics of Technical Logistics I</a>	4 SWS	Lecture / Practice ( / ) ●	Mittwollen
Exams					
WT 24/25	76-T-MACH-109001	<a href="#">Basics of Technical Logistics I</a>			Mittwollen
WT 24/25	76-T-MACH-109919	<a href="#">Basics of Technical Logistics I</a>			Mittwollen

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

#### Prerequisites

none

#### Recommendation

Knowledge of the basics of technical mechanics preconditioned.

#### Workload

120 hours

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



#### Basics of Technical Logistics I

2117095, WS 24/25, 4 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)**  
**On-Site**

#### 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

Students are able to:

- Describe processes and machines of technical logistics,
- Model the fundamental structures and the impacts of material handling machines with mathematical models,
- Refer to industrially used machines
- Model real machines applying knowledge from lessons and calculate their dimensions.

**Organizational issues**

Die Erfolgskontrolle erfolgt in Form einer schriftlichen oder mündlichen Prüfung (nach §4 (2), 1 bzw. 2SPO).

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

Es wird Kenntnis der Grundlagen der Technischen Mechanik vorausgesetzt.

Basics knowledge of technical mechanics is preconditioned.

Ergänzungsblätter, Präsentationen, Tafel.

Supplementary sheets, presentations, blackboard.

Präsenz: 48Std

Nacharbeit: 132Std

presence: 48h

rework: 132h

**Literature**

Empfehlungen in der Vorlesung / Recommendations during lessons

## T

**3.20 Course: Basics of Technical Logistics II [T-MACH-109920]****Responsible:** Prof. Dr.-Ing. Kai Furmans**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
2

Events					
WT 24/25	2117098	<a href="#">Basics of Technical Logistics II</a>	3 SWS	Lecture / Practice ( / ) ●	Mittwollen
Exams					
WT 24/25	76-T-MACH-109002	<a href="#">Basics of Technical Logistics II</a>	Mittwollen		
WT 24/25	76-T-MACH-109920	<a href="#">Basics of Technical Logistics II</a>	Mittwollen		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

The assessment consists of a written exam (60 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

**Prerequisites**

none

**Recommendation**

Knowledge of the basics of technical mechanics and out of "Basic of Technical Logistics I" (T-MACH-109919) preconditioned.

**Workload**


150 hours




## T

## 3.21 Course: Batteries and Fuel Cells [T-CHEMBIO-112316]

**Responsible:** Prof. Dr. Helmut Ehrenberg**Organisation:** KIT Department of Chemistry and Biosciences**Part of:** [M-MACH-106252 - Courses of the KIT Department of Chemistry and Biosciences](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	4	Grade to a third	Each winter term	1 terms	1

Events					
WT 24/25	5072	<a href="#">Batteries and Fuel Cells</a>	2 SWS	Lecture / 	Ehrenberg, Scheiba
Exams					
WT 24/25	7100050	<a href="#">Batteries and Fuel Cells</a>	Ehrenberg		

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

Oral exam, about 25 minutes

**Workload**


120 hours




## T

## 3.22 Course: Bioelectric Signals [T-ETIT-101956]

**Responsible:** Dr.-Ing. Axel Loewe**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	3	Grade to a third	Each summer term	2

Events					
ST 2025	2305264	<a href="#">Bioelectric Signals</a>	2 SWS	Lecture / 	Loewe
Exams					
ST 2025	7305264	<a href="#">Bioelectric Signals</a>			Loewe

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**


The examination is a written examination with a duration of 90 minutes.





**Prerequisites**

none

## T

**3.23 Course: BioMEMS - Microsystems Technologies for Life-Sciences and Medicine I [T-MACH-100966]****Responsible:** Prof. Dr. Andreas Guber**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Written examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
2

Events					
WT 24/25	2141864	<a href="#">BioMEMS - Microsystems Technologies for Life-Sciences and Medicine I</a>	2 SWS	Lecture / 	Guber, Ahrens
Exams					
WT 24/25	76-T-MACH-100966	<a href="#">BioMEMS - Microsystems Technologies for Life-Sciences and Medicine I</a>			Guber
ST 2025	76-T-MACH-100966	<a href="#">BioMEMS - Microsystems Technologies for Life-Sciences and Medicine I</a>			Guber

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam (75 Min.)

**Prerequisites**

none

**Workload**

120 hours

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

## V

**BioMEMS - Microsystems Technologies for Life-Sciences and Medicine I**2141864, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Organizational issues**

BioMEMS I-Klausur: Mo, 17.03.2025, 8:00 - 10:00; 10.11 Hertz-Hörsaal (ggf. auch 10.91 Redtenbacher-Hörsaal)

BioMEMS II-Klausur: Mo, 17.02.2025, 11:00 - 13:00; 10.11 Hertz-Hörsaal

BioMEMS III-Klausur: Do, 20.02.2025, 10:00 - 12:00; 10.11 Hertz-Hörsaal

**Literature**

Menz, W., Mohr, J., O. Paul: Mikrosystemtechnik für Ingenieure, VCH-Verlag, Weinheim, 2005

M. Madou


Fundamentals of Microfabrication





Taylor &amp; Francis Ltd.; Auflage: 3. Auflage. 2011

## T

**3.24 Course: BioMEMS - Microsystems Technologies for Life-Sciences and Medicine II [T-MACH-100967]****Responsible:** Prof. Dr. Andreas Guber**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	2

Events					
ST 2025	2142883	<a href="#">BioMEMS - Microsystems Technologies for Life-Sciences and Medicine II</a>	2 SWS	Lecture / 	Guber, Ahrens
Exams					
WT 24/25	76-T-MACH-100967	<a href="#">BioMEMS - Microsystems Technologies for Life-Sciences and Medicine II</a>	Guber		
ST 2025	76-T-MACH-100967	<a href="#">BioMEMS - Microsystems Technologies for Life-Sciences and Medicine II</a>	Guber		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Written exam (75 Min.)

**Prerequisites**

none

**Workload**

120 hours

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

## V

**BioMEMS - Microsystems Technologies for Life-Sciences and Medicine II**2142883, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
On-Site****Content**

Examples of use in Life-Sciences and biomedicine: Microfluidic Systems:

LabCD, Protein Crystallisation

Microarrays

Tissue Engineering

Cell Chip Systems

Drug Delivery Systems

Micro reaction technology

Microfluidic Cells for FTIR-Spectroscopy

Microsystem Technology for Anesthesia, Intensive Care and Infusion

Analysis Systems of Person's Breath

Neurobionics and Neuroprosthesis

Nano Surgery

**Organizational issues**

Zu jedem Vorlesungstermin werden via ILIAS die jeweiligen Folien im PDF-Format zur Verfügung gestellt.

schriftl. Prüfung: Mo, 09.09.2024, 8 - 10 Uhr; 10.21 Carl-Benz-Hörsaal

**Literature**

Menz, W., Mohr, J., O. Paul: Mikrosystemtechnik für Ingenieure, VCH-Verlag, Weinheim, 2005

Buess, G.: Operationslehre in der endoskopischen Chirurgie, Band I und II;

Springer-Verlag, 1994

M. Madou


Fundamentals of Microfabrication







## T

**3.25 Course: BioMEMS - Microsystems Technologies for Life-Sciences and Medicine III [T-MACH-100968]****Responsible:** Prof. Dr. Andreas Guber**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	2

Events					
ST 2025	2142879	<a href="#">BioMEMS - Microsystems Technologies for Life-Sciences and Medicine III</a>	2 SWS	Lecture / 	Guber, Ahrens
Exams					
WT 24/25	76-T-MACH-100968	<a href="#">BioMEMS - Microsystems Technologies for Life-Sciences and Medicine III</a>			Guber
ST 2025	76-T-MACH-100968	<a href="#">BioMEMS - Microsystems Technologies for Life-Sciences and Medicine III</a>			Guber

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Written exam (75 Min.)

**Prerequisites**

none

**Workload**

120 hours

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

## V

**BioMEMS - Microsystems Technologies for Life-Sciences and Medicine III**2142879, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
On-Site****Content**

Examples of use in minimally invasive therapy

Minimally invasive surgery (MIS)

Endoscopic neurosurgery

Interventional cardiology

NOTES

OP-robots and Endosystems

License of Medical Products and Quality Management

**Organizational issues**

Zu jedem Vorlesungstermin werden via ILIAS die jeweiligen Folien im PDF-Format zur Verfügung gestellt.

schriftl. Prüfung: Mo, 23.09.2024, 10:30 - 12:30 Uhr; 30.21 Christian-Gerthsen-Hörsaal

**Literature**

Menz, W., Mohr, J., O. Paul: Mikrosystemtechnik für Ingenieure, VCH-Verlag, Weinheim, 2005

Buess, G.: Operationslehre in der endoskopischen Chirurgie, Band I und II;  
Springer-Verlag, 1994

M. Madou

Fundamentals of Microfabrication

## T

### 3.26 Course: Boosting the Modern Energy Landscape via Turbo Machines & Machine Learning [T-MACH-113976]

**Responsible:** Prof. Dr.-Ing. Hans-Jörg Bauer

**Organisation:** KIT Department of Mechanical Engineering  
Institute of Thermal Turbomachinery

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Oral examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
3

Events					
WT 24/25	2169558	<a href="#">Boosting the Modern Energy Landscape via Turbo Machines &amp; Machine Learning</a>	2 SWS	Lecture / 	Bauer
Exams					
WT 24/25	76-T-MACH-113359	<a href="#">Boosting the Modern Energy Landscape via Turbo Machines &amp; Machine Learning</a>			Bauer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

#### Competence Certificate

Oral exam, approximately 30 minutes

#### Prerequisites

T-MACH-113359 must not have been started.

#### Recommendation

Profound knowledge on thermodynamics and fluid mechanics is mandatory.

Machine and processes lecture (LVNr. 3134140) is highly recommended before taking this course.

The course requires basic knowledge in engineering mathematics and computer programming at an undergraduate level. Basic knowledge in python is strongly recommended.

We expect students to be interested in applying theoretical knowledge and translate it into real world experiments.

#### Annotation

Lectures: 90 min; Lab sessions: 90 minutes (6 weeks)

#### Workload

120 hours

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

## V

### Boosting the Modern Energy Landscape via Turbo Machines & Machine Learning Lecture (V)

2169558, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)

**On-Site**

## Content

This lecture provides a comprehensive exploration of how small radial flow turbo machines contribute to the modern energy landscape. A typical application of such machines are pressurized fuel cells used as drive train for cars and trucks. From understanding the thermodynamics and flow characteristics of centrifugal compressors and centripetal turbines to practical experiments and the integration of machine learning techniques, students will gain a holistic understanding of the potential of turbo machines for energy conversion efficiency, emissions reduction, and performance optimization. The lecture further provides a hands on sample application of machine learning, with a specific focus on its pivotal role in developing digital twins that utilize sensory data.

During an integrated lab course, learned theoretical A.I. frameworks are applied to a turbo machine test rig for the accurate prediction of the operation and proactive prevention of surge and stall. By engaging in these experimental lab, students explore how sensory data can be leveraged to monitor and optimize the performance of centrifugal compressors. By combining theory and practical lab experience, this course equips students with the knowledge and skills necessary to leverage turbomachinery technology in shaping a sustainable and efficient future energy ecosystem.

The lecture features a distinctive structure consisting of three interconnected layers:

1. **Fundamental Learning:** This initial phase takes place in a traditional classroom setting where students establish a solid understanding of the subject matter.
2. **Hands-On Practical Application:** Students then transition to two dedicated laboratory sessions where they apply the acquired knowledge using real-life equipment, gaining valuable hands-on experience.
3. **Data Analysis and Interpretation:** Following the practical sessions, the lecture moves into two virtual laboratory sessions focused on data-driven techniques. Here, students analyze and interpret the data collected during the hands-on sessions, applying their newfound skills.

This unique approach endows the lecture with a marathon-like nature, requiring students to progress through these phases in sync with their peers. Collaboration is key, as lab sessions are conducted in groups, and students will consolidate and utilize data from all groups. Effective in-group and between-group communication becomes essential for the overall success of the learning experience.

The lecture duration is 21 hours, divided into theory and practical sessions.

pon completing this lecture, students will:

- Gain a comprehensive understanding of radial flow turbo machinery technology and its significance in the modern energy landscape.
- Learn the characteristics of centrifugal compressors and centripetal turbines and how they contribute to energy conversion efficiency, emissions reduction, and performance optimization.
- Engage in practical experiments to explore compressor characteristics, radial flow compressors and turbines, and surge and stall phenomena in radial compressors.
- Be introduced to machine learning principles and applications in turbomachinery technology.
- Gain hands-on experience in building digital twins from sensory data to monitor and optimize centrifugal compressor performance.
- Understand the importance of data-driven predictive maintenance and outlier detection in radial flow turbo machines.
- Learn how to use machine learning techniques to predict and prevent surge and stall issues in centrifugal compressor applications.
- Develop the knowledge and skills necessary to leverage turbomachinery technology in shaping a sustainable and efficient future energy ecosystem.

## Organizational issues

Vorlesung ersetzt Vorlesung-Nr. 2169462 (Turbinen und Verdichterkonstruktionen) ab WS 2023/24

Number of participants are limited due to physical constraints of the integrated lab sessions. To enroll in the lecture, kindly complete the form below. Registration is open from **16.10.2023 (00:00:00)** to **23.10.2023 (23:59:00)** (**Note: The registration period will be extended until 25.10.2023 (23:59:00)**). Following the closure of the registration period, applicants will receive notifications regarding their selection, considering the limited number of available spots.

- Only master level students can be admitted to the course.
- Profound knowledge on thermodynamics and fluid mechanics is mandatory.
- Basic knowledge in python is strongly recommended.
- Machine and processes lecture is highly recommended before taking this course.
- We expect students to be interested in applying theoretical knowledge and translate it into real world experiments.
- Lecture is offered in English.

The lecture is part of the "Research Infrastructures in Research-Oriented Teaching (RIRO)" initiative at KIT.


## Literature




- Münzberg, H.G.: Gasturbinen - Betriebsverhalten und Optimierung, Springer Verlag, 1977.
- Traupel, W.: Thermische Turbomaschinen, Bd. I-II, Springer Verlag, 1977, 1982.
- Saravanamuttoo, H.I.H. et al: Gas Turbine Theory, 7th edition, Pearson, 2018.
- Brunton, S., Kutz, J.: Data-Driven Science and Engineering: Machine Learning, Dynamical Systems, and Control. Cambridge: Cambridge University Press. doi:10.1017/9781108380690
- [gitlab.kit.edu/cihan.ates/data-driven-engineering](https://gitlab.kit.edu/cihan.ates/data-driven-engineering)

## T

## 3.27 Course: Building Technology [T-BGU-100040]

**Responsible:** PD Dr.-Ing. Stephan Wirth**Organisation:** KIT Department of Civil Engineering, Geo and Environmental Sciences**Part of:** [M-MACH-105405 - Courses of the KIT Department of Civil Engineering, Geo and Environmental Sciences](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
WT 24/25	6211910	<a href="#">Gebäudetechnik</a>	2 SWS	Lecture / 	Wirth
Exams					
WT 24/25	8241100040	<a href="#">Building Technology</a>	Altmann		

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**



none


**Workload**

90 hours

## T

**3.28 Course: Business Administration for Engineers and IT Professionals [T-MACH-109933]****Responsible:** Heinz-Peter Sebgregondi**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Examination of another type**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
WT 24/25	2122303	<a href="#">Business Administration for Engineers and IT professionals</a>	2 SWS	Seminar / 	Sebgregondi
ST 2025	2122303	<a href="#">Business Administration for Engineers and IT professionals</a>	2 SWS	Seminar / 	Sebgregondi
Exams					
WT 24/25	76-T-MACH-109933	<a href="#">Business Administration for Engineers and IT professionals</a>	Sebgregondi		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Assessment of another type. Two presentations and six written compositions in team work. Grading: each composition 1/8 and each presentation 1/8.

**Prerequisites**

None

**Workload**

120 hours

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

## V

**Business Administration for Engineers and IT professionals**2122303, WS 24/25, 2 SWS, Language: German/English, [Open in study portal](#)**Seminar (S)**  
**On-Site****Content**

Learning content

- Competitive strategies, customer value, corporate cultures, lifecycles (technology, business, product), market leadership dynamics.
- Continuum commoditization/differentiation.
- Value chain, core and support functions.
- A company's business portfolio.
- Profit margin sensitivity.
- Profitable and non-profitable products, customers and businesses.
- Drivers of a company's value (McKinsey model), return on invested capital (ROIC), ROIC value driver tree.
- Strategic planning
- Capital investments, discounted cash flow analysis, quantifying of and dealing with risks, cost-estimating methodologies per planning stage.
- Sales, procurement/purchasing, negotiation strategies

Learning objectives

- better understand a company's business, financials and their executives/decision makers
- use the language and metrics of senior executives and hold effective conversations with them
- more effectively sell a solution's or project's operational and financial value to executives and decision makers

**Organizational issues**

Teilnehmerzahl ist begrenzt. Zeit und Ort siehe ILIAS / Number of participants is limited. Time and place see ILIAS.

**Literature**

Understanding a company's business and financials made easy; Heinz-Peter Sebrengondi (Amazon 2017)

Erfolgsfaktoren für die nachhaltige Business-Karriere: Die menschliche und die Business-Perspektive; Heinz-Peter Sebrengondi (Amazon 2018)

**Business Administration for Engineers and IT professionals**

2122303, SS 2025, 2 SWS, Language: German/English, [Open in study portal](#)

**Seminar (S)**  
**On-Site**

**Content**

Learning content

- Competitive strategies, customer value, corporate cultures, lifecycles (technology, business, product), market leadership dynamics.
- Continuum commoditization/differentiation.
- Value chain, core and support functions.
- A company's business portfolio.
- Profit margin sensitivity.
- Profitable and non-profitable products, customers and businesses.
- Drivers of a company's value (McKinsey model), return on invested capital (ROIC), ROIC value driver tree.
- Strategic planning
- Capital investments, discounted cash flow analysis, quantifying of and dealing with risks, cost-estimating methodologies per planning stage.
- Sales, procurement/purchasing, negotiation strategies

Learning objectives

- better understand a company's business, financials and their executives/decision makers
- use the language and metrics of senior executives and hold effective conversations with them
- more effectively sell a solution's or project's operational and financial value to executives and decision makers

**Organizational issues**

Teilnehmerzahl ist begrenzt. / Number of participants is limited.

**Literature**


Understanding a company's business and financials made easy; Heinz-Peter Sebrengondi (Amazon 2017)





Erfolgsfaktoren für die nachhaltige Business-Karriere: Die menschliche und die Business-Perspektive; Heinz-Peter Sebrengondi (Amazon 2018)

## T

**3.29 Course: CAD-NX Training Course [T-MACH-102187]****Responsible:** Prof. Dr.-Ing. Jivka Ovtcharova**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (practical)	2	pass/fail	Each term	2

Events					
WT 24/25	2123357	<a href="#">CAD-NX training course</a>	2 SWS	Practical course / 	Rönnau, Mitarbeiter
Exams					
WT 24/25	76-T-MACH-102187	<a href="#">CAD-NX Training Course</a>	Rönnau		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Practical verification as academic achievement by working on a design task on the CAD computer, duration: 60 min.

**Prerequisites**

None

**Recommendation**

Dealing with technical drawings is required.

**Annotation**

For the practical course compulsory attendance exists.

**Workload**

60 hours

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

## V

**CAD-NX training course**2123357, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Practical course (P)  
Blended (On-Site/Online)****Content**

- 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

Students are able to:

- create their own 3D geometric models in the CAD system NX and generate drawings due to the created geometry
- carry out FE-studies and kinematic simulations using the integrated CAE tools
- use advanced, knowledge-based functionalities of NX to automate the creation of geometry and thus to ensure the reusability of the models.

**Organizational issues**

Das Praktikum kann entweder vorlesungsbegleitend oder als einwöchige Blockveranstaltung in der vorlesungsfreien Zeit absolviert werden. Weitere Informationen siehe ILIAS.

**Literature**

Praktikumsskript

## T

**3.30 Course: CAE-Workshop [T-MACH-105212]**

**Responsible:** Prof. Dr.-Ing. Tobias Düser  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)



**Type**  
Examination of another type

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
2

Events					
WT 24/25	2147175	<a href="#">CAE-Workshop</a>	3 SWS	Block / 	Düser
ST 2025	2147175	<a href="#">CAE-Workshop</a>	3 SWS	Block / 	Düser
Exams					
WT 24/25	76-T-MACH-105212	<a href="#">CAE-Workshop</a>	Düser		
ST 2025	76-T-MACH-105212	<a href="#">CAE-Workshop</a>	Albers, Düser		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Written test (with practical part on the computer), duration 60 min.

**Prerequisites**

None

**Annotation**

Consistent attendance on the workshop days is required for successful participation in the exam. The number of participants is limited. Selection will be made by drawing lots after the end of the registration period.

**Workload**

120 hours

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

## V

**CAE-Workshop**

2147175, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Block (B)**  
**On-Site**

**Content**

Content:

- 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 topology and shape optimization
- Creation and calculation of various optimization models with the Abaqus optimization package

The students are able to:

- name the purposes and limits of numerical simulation and optimization of the virtual product development.
- solve simple realistic tasks in the field of finite element analysis and structure optimization with industrial common software.
- evaluate and to question the results of a simulation.
- identify and improve the mistakes of a simulation or optimization.

Regular attendance: 31.5 h

Self-study: 88.5 h

Exam: 1h written



**Organizational issues**

Wir empfehlen den Workshop ab dem 5. Semester.

Anmeldung erforderlich. Weitere Informationen siehe IPEK-Homepage.

Anwesenheitspflicht

**Literature**

Kursunterlagen werden in Ilias bereitgestellt.

Content is provided on Ilias.

**CAE-Workshop**

2147175, SS 2025, 3 SWS, Language: German, [Open in study portal](#)

**Block (B)**  
**On-Site**

**Content**

Content:

- 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 topology and shape optimization
- Creation and calculation of various optimization models with the Abaqus optimization package

The students are able to:

- name the purposes and limits of numerical simulation and optimization of the virtual product development.
- solve simple realistic tasks in the field of finite element analysis, multi-body-simulation and structure optimization with industrial common software (the content in winter and summer term is different).
- evaluate and to question the results of a simulation.
- identify and improve the mistakes of a simulation or optimization.

Exam: 1h Regularly written

Regular attendance: 31.5 h

Self-study: 88.5 h

Annotation: Number of participants limited. The selection will be made by drawing after the end of the registration period.

**Organizational issues**

Wir empfehlen den Workshop ab dem 5. Semester.

Anmeldung erforderlich. Weitere Informationen siehe IPEK-Homepage.

Anwesenheitspflicht

**Literature**


Kursunterlagen werden in Ilias bereitgestellt.





Content is provided on Ilias.

## T

**3.31 Course: CATIA Advanced [T-MACH-105312]****Responsible:** Prof. Dr.-Ing. Jivka Ovtcharova**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	4	Grade to a third	Each term	1

Events					
WT 24/25	2123380	<a href="#">Advanced CATIA</a>	3 SWS	Project (P /  )	Rönnau, Mitarbeiter
Exams					
WT 24/25	76-T-MACH-105312	<a href="#">CATIA Advanced</a>	Rönnau		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Assessment of another type. Design project and written documentation in team work and final presentation. Grading: Project work 3/5, documentation 1/5 and presentation 1/5.

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Advanced CATIA**2123380, WS 24/25, 3 SWS, Language: German/English, [Open in study portal](#)**Project (PRO)**  
**Blended (On-Site/Online)****Content**

In this design project, students develop a product in small groups according to an agile approach using the 3DEXPERIENCE platform (CATIA V6) from Dassault Systèmes. The extended functionalities of the platform are addressed and model-based work is carried out.

The development process is traced from the idea to the finished model. The main focus is on independent solution finding, teamwork, function fulfillment, production and design. The project results are presented at the end of the semester.

**Organizational issues**

Siehe ILIAS zur Lehrveranstaltung


**Literature**





Keine / None

## T

**3.32 Course: CATIA CAD Training Course [T-MACH-102185]****Responsible:** Prof. Dr.-Ing. Jivka Ovtcharova**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (practical)	2	pass/fail	Each term	2

Events					
WT 24/25	2123358	<a href="#">CATIA CAD training course</a>	2 SWS	Practical course / 	Rönnau, Mitarbeiter
Exams					
WT 24/25	76-T-MACH-102185	<a href="#">CATIA CAD Training Course</a>			Rönnau

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**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.

**Workload**

50 hours

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

## V

**CATIA CAD training course**2123358, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Practical course (P)  
Blended (On-Site/Online)****Content**

- 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 constraints
- Strength analysis with FEM
- Kinematic simulation with DMU
- Dealing with CATIA Knowledgeware

Students are able to:

- create their own 3D geometric models in the CAD system CATIA and generate drawings due to the created geometry
- carry out FE-studies and kinematic simulations using the integrated CAE tools
- use advanced, knowledge-based functionalities of CATIA to automate the creation of geometry and thus to ensure the reusability of the models.

**Organizational issues**

Das Praktikum kann vorlesungsbegleitend absolviert werden oder als einwöchige Blockveranstaltung in der vorlesungsfreien Zeit. Weitere Informationen siehe ILIAS.


**Literature**





Praktikumsript

## T

**3.33 Course: CFD for Power Engineering [T-MACH-105407]****Responsible:** Dr. Ivan Otic**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2130910	<a href="#">CFD for Power Engineering</a>	2 SWS	Lecture / 	Otic

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral exam, 30 min

**Prerequisites**

none

**Workload**

120 hours

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

## V

**CFD for Power Engineering**2130910, SS 2025, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**Blended (On-Site/Online)**

**Content****Contents:**

The course is aimed of giving the fundamental of Computational Fluid Dynamics (CFD) for energy technologies. Starting from the basic physical phenomena equations an overview on computational methods and turbulence modeling is given.

The course consists of both, a theoretical and a numerical component. The former will deal with the derivations and properties of the methods and models for CFD. The numerical part will make use of open source CFD computer program OpenFOAM to give a "hands on" insight into the simulation of turbulent flows. After completing the course you should be able to establish a connection between theory and CFD modeling and simulation for energy applications.

**Tentative Course Outline:**

The weekly coverage might change as it depends on the progress of the class.

**Content**

- 1 Introduction: What is Computational Fluid Dynamics?
- 2 Governing Equations
- 3 Numerical Methods: Introduction
- 4 Numerical Methods: Finite Volume
- 5 Numerical Methods: Solution of ordinary differential equations
- 6 Numerical Methods: Convergence and numerical stability
- 7 Turbulence and Turbulence Modelling
- 8 Reynolds Averaged Navier-Stokes Simulation Approach
- 9 Heat Transfer

**CFD Project:**

- Part of this class is performing CFD simulations of turbulent heat and mass transfer using open-source CFD software OpenFOAM
- After CFD analysis is completed students have to write a technical report
- Projects are to be performed individually or in teams of two but every student writes his own report
- The CFD analysis technical report is part of the final examination.

**Objectives:**

After completing the course students:

- are able to understand fundamentals of non-linear partial differential equations
- will get working knowledge of computational techniques that can be used for solving engineering heat and mass transfer problems
- are able to understand fundamentals of statistical fluid mechanics and to derive RANS transport equations
- have learned how to computationally solve turbulent heat and mass transfer problems using OpenFOAM software
- are able to present their results in form of technical report.

**Literature**

Vorlesungsskript

Projektskript und Unterlagen


An Introduction to Computational Fluid Dynamics: The Finite Volume Method, H. Versteeg and W. Malalasekera, 2007.





Ferziger, J; Peric, M.: Computational Methods for Fluid Dynamics, Springer 2002.

## T

**3.34 Course: CFD-Lab Using OpenFOAM [T-MACH-105313]****Responsible:** Dr.-Ing. Rainer Koch**Organisation:** KIT Department of Mechanical Engineering  
Institute of Thermal Turbomachinery**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each winter term	1

Events					
WT 24/25	2169459	<a href="#">CFD-Lab using OpenFOAM</a>	3 SWS	Practical course / 	Koch
Exams					
WT 24/25	76-T-MACH-105313	<a href="#">CFD-Lab Using Open Foam</a>	Koch		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Successful solution of problems

**Prerequisites**

none

**Workload**

120 hours

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

## V

**CFD-Lab using OpenFOAM**2169459, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)**Practical course (P)**  
**On-Site****Content**

- Successful solution of problems
- Course material is distributed on ILIAS
- Introduction to using Open Foam
- Grid generation
- Boundary conditions
- Numerical errors
- Discretization schemes
- Turbulence models
- Two phase flow - Euler-Lagrange
- Large Eddy Simulation
- Combustion

The students are able to:

- use OpenFOAM
- generate simple grids or import grids into OpenFOAM
- choose and define appropriate boundary conditions
- estimate numerical errors and asses them
- judge turbulence models and select an appropriate model
- simulate 2-phase flows using suitable models

**Organizational issues****Literature**

- Dokumentation zu OpenFOAM
- <https://openfoam.org/>

**T****3.35 Course: Chemical, Physical and Material Scientific Aspects of Polymers in  
Microsystem Technologies [T-MACH-102169]****Responsible:** Dr.-Ing. Matthias Worgull**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	3	Grade to a third	Each term	1

**Competence Certificate**

The assessment will consist of a oral exam (30 min) (following §4 (2), 2 of the examination regulation).

**Prerequisites**

none

## T


**3.36 Course: Cognitive Automobiles - Laboratory [T-MACH-105378]**





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

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each summer term	1

Events					
ST 2025	2138341	<a href="#">Cognitive Automobiles - Laboratory</a>	3 SWS	/ 	Stiller, Lauer, Blumberg

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**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).

**Workload**

180 hours

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

## V

**Cognitive Automobiles - Laboratory**

2138341, SS 2025, 3 SWS, Language: German, [Open in study portal](#)

**On-Site**

**Content****Lehrinhalt (EN):**

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

**Lernziele (EN):**

The laboratory accompanies the lectures "Automotive Vision" and "Behaviour Generation for Vehicles". It will provide the opportunity of turning theoretical skills taught in the lecture to practice. The laboratory is divided into four groups with a maximum number of five students in each group. During the lessons you will be supervised by scientific staff.

The lecture addresses students in mechanical engineering and related subjects who intend to get an interdisciplinary knowledge in a state-of-the-art technical domain. Machine vision, vehicle kinematics and advanced information processing techniques are presented to provide a broad overview on "seeing vehicles". Each group is given the task to extract lane markings from video images and generate a suitable trajectory which the vehicle should follow. Apart from technical aspects in a highly innovative field of automotive technology, participants have the opportunity of gathering important qualifications as i.e. implementation skills, acquisition and comprehension of suitable literature, project and team work.

**Nachweis:** Colloquia, final race

**Arbeitsaufwand:** 120 hours

**Literature**

Dokumentation zur SW und HW werden als pdf bereitgestellt.



## T


**3.37 Course: Combined Cycle Power Plants [T-MACH-105444]**

**Responsible:** Prof. Dr.-Ing. Daniel Banuti  
Hon.-Prof. Dr. Thomas Schulenberg

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2170490	<a href="#">Combined Cycle Power Plants</a>	2 SWS	Lecture / 	Banuti, Schulenberg
Exams					
WT 24/25	76-T-MACH-105444	<a href="#">Combined Cycle Power Plants</a>			Banuti, Schulenberg

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam ca. 30 min

**Prerequisites**

none

**Recommendation**

We recommend to combine the lecture with the Simulator Exercises for Combined Cycle Power Plants (T-MACH-105445).

**Workload**

120 hours

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

## V

**Combined Cycle Power Plants**

2170490, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

The training objective of the course is the qualification for a research-related professional activity in power plant engineering. The participants can name the most important components of the combined cycle power plant and describe their function. They can design or modify combined cycle power plants independently and creatively. They have acquired a broad knowledge of this power plant technology, including specific knowledge of gas turbine design, steam turbine design and boiler design. On this basis, they can describe and analyze the specific behavior of the power plant components as well as the entire power plant in the grid. Participants in the lecture have a trained analytical thinking and judgment in power plant design.

Layout of a combined cycle power plant, design and operation of gas turbines, of the heat recovery steam generator, of the feedwater system and cooling systems. Design and operation of steam turbines, of the generator and its electrical systems. System response to challenging grids, protection systems, water make-up and water chemistry. Design concepts of different power plant manufacturers, innovative power plant concepts.

**Literature**

Die gezeigten Vorlesungsfolien und weiteres Unterrichtsmaterial werden bereitgestellt.

Ferner empfohlen:

C. Lechner, J. Seume, Stationäre Gasturbinen, Springer Verlag, 2. Auflage 2010



### 3.38 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2133113	<a href="#">CO<sub>2</sub>-neutral combustion engines and their fuels I</a>	3 SWS	Lecture / Practice ( / ) 	Koch
Exams					
WT 24/25	76-T-MACH-102194	<a href="#">CO<sub>2</sub>-neutral combustion engines and their fuels I</a>	Kubach, Koch		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

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

#### Prerequisites

none

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



#### CO<sub>2</sub>-neutral combustion engines and their fuels I

2133113, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

Lecture / Practice (VÜ)  
On-Site

#### Content

Introduction, Presentation of IFKM

Working Principle

Characteristic Parameters

Engine Parts

Drive Train

Fuels

Gasoline Engines

Diesel Engines

Hydrogen Engines

Exhaust Gas Emissions

#### Organizational issues

Übungstermine Donnerstags nach Bekanntgabe in der Vorlesung

## T

**3.39 Course: Combustion Engines II [T-MACH-104609]**

**Responsible:** Dr.-Ing. Rainer Koch  
Dr.-Ing. Heiko Kubach

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	5	Grade to a third	Each summer term	1

Exams			
WT 24/25	76-T-MACH-104609	<a href="#">Combustion Engines, Hydrogen Engines and CO2 neutral Fuels II</a>	Kubach, Koch

**Competence Certificate**

oral examination, duration: 25 minutes, no auxiliary means

**Prerequisites**

none

**Recommendation**


Fundamentals of Combustion Engines I helpful





**T****3.40 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

Lightweight Design

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	4

Events					
ST 2025	2114053	<a href="#">Composite Manufacturing – Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies</a>	2 SWS	Lecture / 	Henning
Exams					
WT 24/25	76-T-MACH-105535	<a href="#">Composite Manufacturing - Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies</a>			Henning

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam 90 minutes

**Prerequisites**

T-MACH-114001, T-MACH-114002 and T-MACH-114191 must not have been started

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Composite Manufacturing – Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies**2114053, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
On-Site**

**Content**Physical connections of fiber reinforcementUse 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 - textilesProcess technologies - prepregsRecycling of composites**Aim of this lecture:**

Students know different polymer resin materials and fiber materials and can deduce their character and use.

They understand the reinforcing effect of fibers in a matrix surrounding as well as the tasks of the single components in a compound. They know about the influence of the length of fibers, their mechanical characters and performance in a polymer matrix compound.

Student know the important industrial production processes for continuous and discontinuous reinforced polymer matrix compounds.

**Literature****Literatur Leichtbau II**

[1-7]

[1] M. Flemming and S. Roth, *Faserverbundbauweisen : Eigenschaften; mechanische, konstruktive, thermische, elektrische, ökologische, wirtschaftliche Aspekte*. Berlin: Springer, 2003.

[2] M. Flemming, *et al.*, *Faserverbundbauweisen : Halbzeuge und Bauweisen*. Berlin: Springer, 1996.

[3] M. Flemming, *et al.*, *Faserverbundbauweisen : Fasern und Matrices*. Berlin: Springer, 1995.

[4] M. Flemming, *et al.*, *Faserverbundbauweisen : Fertigungsverfahren mit duroplastischer Matrix*. Berlin: Springer, 1999.

[5] H. Schürmann, *Konstruieren mit Faser-Kunststoff-Verbunden : mit ... 39 Tabellen*, 2., bearb. und erw. Aufl. ed. Berlin: Springer, 2007.

[6] A. Puck, *Festigkeitsanalyse von Faser-Matrix-Laminaten : Modelle für die Praxis*. München: Hanser, 1996.

[7] M. Knops, *Analysis of failure in fibre polymer laminates : the theory of Alfred Puck*. Berlin, Heidelberg [u.a.]: Springer, 2008.

**3.41 Course: Computational Continuum Mechanics [T-MACH-112987]****Responsible:** Prof. Dr.-Ing. Thomas Böhlke**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each summer term	1 terms	2

Events					
ST 2025	2162261	<a href="#">Computational Continuum Mechanics</a>	2 SWS	Lecture /	Böhlke

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Written exam (90 min). Additives as announced.

Admission to the exam: Coursework in *Tutorial Computational Continuum Mechanics* (T-MACH-112996) must be passed**Prerequisites**Coursework in *Tutorial Computational Continuum Mechanics* (T-MACH-112996) must be passed**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-112996 - Tutorial Computational Continuum Mechanics](#) must have been passed.

**Workload**

90 hours

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

**Computational Continuum Mechanics**2162261, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****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
- constitutive equations for solids and fluids
- Formulation of initial-boundary-value problems

**Literature**

Vorlesungsskript

Liu, I-S.: Continuum Mechanics. Springer, 2002.

Greve, R.: Kontinuumsmechanik, Springer 2003

Schade, H.: Tensoranalysis. Walter de Gruyter, New York, 1997.

Schade, H: Strömungslehre, de Gruyter 2013



## T



**3.42 Course: Computational Dynamics [T-MACH-105349]**

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

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
WT 24/25	2162246	<a href="#">Computational Dynamics</a>	2 SWS	Lecture / 	Proppe
ST 2025	2162246	<a href="#">Computational Dynamics</a>	2 SWS	Lecture / 	Proppe
Exams					
WT 24/25	76-T-MACH-105349	<a href="#">Computational Dynamics</a>	Proppe		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, duration approx. 20 min.

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Computational Dynamics**

2162246, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
Online

**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

**Literature**

1. Ein Vorlesungsskript wird bereitgestellt!
2. M. Géradin, B. Rixen: Mechanical Vibrations, Wiley, Chichester, 1997

## V

**Computational Dynamics**

2162246, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
Online

**Content**

1. Continuum dynamics
2. Variational principles
3. Ritz method
4. Finite element method in dynamics
5. Modell order reduction
6. Numerical solution of nonlinear algebraic equations
7. Numerical solution of eigenvalue problems
8. Time integration for systems of 2nd order differential equations

**Organizational issues**

Für diese Vorlesung werden online Unterlagen bereitgestellt.

**Literature**

1. Ein Vorlesungsskript wird auf Ilias bereitgestellt!
2. M. Géradin, B. Rixen: Mechanical Vibrations, Wiley, Chichester, 1997



## T


**3.43 Course: Computational Intelligence [T-MACH-105314]**




**Responsible:** Stefan Meisenbacher  
apl. Prof. Dr. Ralf Mikut  
apl. Prof. Dr. Markus Reischl

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each winter term	1

Events					
WT 24/25	2105016	<a href="#">Computational Intelligence</a>	2 SWS	Lecture / 	Mikut, Reischl, Meisenbacher
Exams					
WT 24/25	76-T-MACH-105314	<a href="#">Computational Intelligence</a>	Mikut		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Written exam (Duration: 1h)

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Computational Intelligence**

2105016, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**

**Content**

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

**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
- Deep Learning: History, Architectures, Training strategies, Interpretability and Explainable AI, Use Cases

**Learning objectives:**

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

**Literature**

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

**3.44 Course: Computational Mechanics I [T-MACH-105351]**

**Responsible:** Prof. Dr.-Ing. Thomas Böhlke  
Dr.-Ing. Tom-Alexander Langhoff

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Oral examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	2161250	<a href="#">Computational Mechanics I</a>	2 SWS	Lecture / 	Langhoff, Böhlke
Exams					
WT 24/25	76-T-MACH-105351	<a href="#">Computational Mechanics I</a>			Langhoff, Böhlke

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

oral examination, 30 min.

### Prerequisites

none

### Recommendation

The contents of the lectures "Mathematical Methods in Continuum Mechanics" and "Introduction to the Finite Element Method" are assumed to be known

This course is geared to MSc students of Mechanical Engineering

### Workload

180 hours

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

## V

**Computational Mechanics I**

2161250, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

### Content

- numerical solution of linear systems
- boundary value problems of linear elasticity
- solution methods of the boundary value problem of linear elasticity
- variational principles of linear elasticity
- finite-element-technology for linear static problems

### Literature

Haupt, P.: Continuum Mechanics and Theory of Materials. Springer 2002.

W. S. Slaughter: The linearized theory of elasticity. Birkhäuser, 2002.

J. Betten: Finite Elemente für Ingenieure 2, Springer, 2004.

**3.45 Course: Computational Mechanics II [T-MACH-105352]**

**Responsible:** Prof. Dr.-Ing. Thomas Böhlke  
Dr.-Ing. Tom-Alexander Langhoff

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each summer term	2

Events					
ST 2025	2162296	<a href="#">Computational Mechanics II</a>	2 SWS	Lecture /	Böhlke, Langhoff
ST 2025	2162297	<a href="#">Tutorial Computational Mechanics II</a>	2 SWS	Practice /	Gisy, Hille, Böhlke, Langhoff

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral examination, 30 min.

**Prerequisites**

none

**Workload**

180 hours

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

**Computational Mechanics II**

2162296, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

overview quasistatic nonlinear phenomena; numerics of nonlinear systems; balance equations of geometrically nonlinear solid mechanics; infinitesimal plasticity; linear and geometrically nonlinear thermoelasticity

**Literature**

Simó, J.C.; Hughes, T.J.R.: Computational Inelasticity. Springer 1998; Haupt, P.: Continuum Mechanics and Theory of Materials. Springer 2002; Belytschko, T.; Liu, W.K.; Moran, B.: Nonlinear FE for Continua and Structures. JWS 2000

**Tutorial Computational Mechanics II**

2162297, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)**  
**On-Site**

**Content**

see lecture "Computational Mechanics II"

**Organizational issues**

weitere Informationen in der ersten Vorlesung

**Literature**

siehe Vorlesung "Rechnerunterstützte Mechanik II"



## T



**3.46 Course: Computational Vehicle Dynamics [T-MACH-105350]**

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

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
WT 24/25	2162256	<a href="#">Computational Vehicle Dynamics</a>	2 SWS	Lecture / 	Proppe
ST 2025	2162256	<a href="#">Computational Vehicle Dynamics</a>	2 SWS	Lecture / 	Proppe
Exams					
WT 24/25	76-T-MACH-105350	<a href="#">Computational Vehicle Dynamics</a>	Proppe		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**  
 oral exam, 20 min.

**Prerequisites**  
 none

**Workload**  
 120 hours

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

## V

**Computational Vehicle Dynamics**

2162256, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**Online**

**Content**

This course serves as an introduction into the computational modelling and simulation of technical system road/ vehicle. A method based perspective is taken which allows for a unified treatment of various kinds of vehicles. The vehicle model is obtained by dividing the system into functional subsystems and defining interfaces between these subsystems.

In the first part of the course, vehicle models will be developed based on models of the suspensions, the road, and the contact forces between road and vehicle. The focus of the second part of the course is on computational methods for linear and non-linear models of vehicle systems. The third part of the course discusses design criteria for stability, safety and ride comfort. Multibody dynamics simulations will be carried out using Matlab/ Simulink.

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

**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

## V

**Computational Vehicle Dynamics**

2162256, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

This course serves as an introduction into the computational modelling and simulation of the road/ vehicle system. A method based perspective is taken which allows for a unified treatment of various kinds of vehicles. The vehicle model is obtained by dividing the system into functional subsystems and defining interfaces between these subsystems.

In the first part of the course, vehicle models will be developed based on models of the suspensions, the road, and the contact forces between road and vehicle. The focus of the second part of the course is on computational methods for linear and non-linear models of vehicle systems. The third part of the course discusses design criteria for stability, safety and ride comfort.

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

**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

**3.47 Course: Computer Science for Engineers [T-MACH-105205]****Responsible:** Prof. Dr.-Ing. Jivka Ovtcharova**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each summer term	1

Exams				
WT 24/25	76-T-MACH-105205	<a href="#">Computer Science for Engineers - German</a>		Meyer, Rönnau

**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, Prerequisite](#) must have been passed.

**Workload**

180 hours

**T****3.48 Course: Computer Science for Engineers, Prerequisite [T-MACH-105206]****Responsible:** Prof. Dr.-Ing. Jivka Ovtcharova**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (practical)	0	pass/fail	Each summer term	2

**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



**T****3.49 Course: Computerized Multibody Dynamics [T-MACH-105384]****Responsible:** Felix Boy**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
1**Events**

WT 24/25	2162216	<a href="#">Computerized Multibody Dynamics</a>	2 SWS	Lecture / <b>x</b>	Boy
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Legend: Online, Blended (On-Site/Online), On-Site, **x** Cancelled**Competence Certificate**

Oral exam, 30 min.

**Prerequisites**

none

**Recommendation**

Knowledge of EM III/IV

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Computerized Multibody Dynamics**2162216, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**Cancelled****Organizational issues**

Die Vorlesung wird im WS 24/25 nicht angeboten.

**Literature**

Kane, T.: Dynamics, Theory and Applications, McGrawHill, 1985

AUTOLEV: User Manual

## T

**3.50 Course: Constitution and Properties of Protective Coatings [T-MACH-105150]****Responsible:** Prof. Sven Ulrich**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2177601	<a href="#">Constitution and Properties of Protective Coatings</a>	2 SWS	Lecture /	Ulrich
Exams					
WT 24/25	76-T-MACH-105150	<a href="#">Constitution and Properties of Protective Coatings</a>			Ulrich
ST 2025	76-T-MACH-105150	<a href="#">Constitution and Properties of Protective Coatings</a>			Ulrich

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral examination (about 30 min)

no tools or reference materials

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Constitution and Properties of Protective Coatings**2177601, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

oral examination (about 30 min); no tools or reference materials

Teaching Content:

introduction and overview

concepts of surface modification

coating concepts

coating materials

methods of surface modification

coating methods

characterization methods

state of the art of industrial coating of tools and components

new developments of coating technology

regular attendance: 22 hours

self-study: 98 hours

Transfer of the basic knowledge of surface engineering, of the relations between constitution, properties and performance, of the manifold methods of modification, coating and characterization of surfaces.

Recommendations: none

**Organizational issues**

Falls die Vorlesung online stattfinden muss, bitte um Anmeldung unter [sven.ulrich@kit.edu](mailto:sven.ulrich@kit.edu) bis zum 22.10.24.


Den entsprechenden MS Teams Link erhalten Sie dann per E-Mail am 23.10.24.





**Literature**

Bach, F.-W.: Modern Surface Technology, Wiley-VCH, Weinheim, 2006

Abbildungen und Tabellen werden verteilt; Copies with figures and tables will be distributed

**T****3.51 Course: Constitution and Properties of Wearresistant Materials [T-MACH-102141]****Responsible:** Prof. Sven Ulrich**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
3

Events					
ST 2025	2194643	<a href="#">Constitution and Properties of Wear resistant materials</a>	2 SWS	Lecture / 	Ulrich
Exams					
WT 24/25	76-T-MACH-102141	<a href="#">Constitution and Properties of Wearresistant Materials</a>			Ulrich
ST 2025	76-T-MACH-102141	<a href="#">Constitution and Properties of Wearresistant Materials</a>			Ulrich

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral examination (about 30 min)

no tools or reference materials

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Constitution and Properties of Wear resistant materials**2194643, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site**

**Content**

The assessment consists of an oral exam (ca. 30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

Teaching 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

regular attendance: 22 hours

self-study: 98 hours

Basic understanding of constitution of wear-resistant materials, of the relations between constitution, properties and performance, of principles of increasing of hardness and toughness of materials as well as of the characteristics of the various groups of wear-resistant materials.

Recommendations: none

**Organizational issues**

Die Blockveranstaltung findet in folgendem Zeitraum statt:

11.06.-13.06.2025: jeweils von 8:00-17:15 Uhr;

Ort: KIT-CN, Geb. 681, Raum 214

Anmeldung verbindlich bis zum 04.06.2025 unter [sven.ulrich@kit.edu](mailto:sven.ulrich@kit.edu).

Nach der Anmeldung wird Ihnen im Falle einer Online-Veranstaltung der Link zur Vorlesung per E-Mail am 10.06.2025 mitgeteilt.

**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

Kopien der Abbildungen und Tabellen werden verteilt; Copies with figures and tables will be distributed



### 3.52 Course: Contact Mechanics [T-MACH-105786]

**Responsible:** Prof. Dr. Christian Greiner

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2181220	<a href="#">Contact Mechanics</a>	2 SWS	Lecture /	Greiner
Exams					
WT 24/25	76-T-MACH-105786	<a href="#">Contact Mechanics</a>			Greiner
ST 2025	76-T-MACH-105786	<a href="#">Contact Mechanics</a>			Greiner

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

oral exam ca. 30 minutes

#### Prerequisites

none

#### Recommendation

preliminary knowledge in mathematics, physics and materials science

#### Workload

120 hours

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



### Contact Mechanics

2181220, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

The course introduces contact mechanics of smooth and rough surface for non-adhesive and adhesive interfacial conditions. There will a computer lab held in parallel to the lecture that teaches numerical approaches to contact mechanical problems.

1. Introduction: contact area and stiffness
2. Theory of the elastic half-space
3. Contact of nonadhesive spheres: Hertz theory
4. Physics and chemistry of adhesive interactions at interfaces
5. Contact of adhesive spheres: theories of Johnson-Kendall-Roberts, Derjaguin-Muller-Toporov and Maugis-Dugdale
6. Surface roughness: topography, power spectral density, structure of real surfaces, fractal surfaces as a model, metrology
7. Contact of nonadhesive rough surfaces: theories of Greenwood-Williamson, Persson, Hyun-Pei-Robbins-Molinari
8. Contact of adhesive rough surface: theories of Fuller-Tabor, Persson and recent numerical results
9. Contact of rough spheres: theory of Greenwood-Tripp and recent numerical results
10. Lateral and sliding contact: theories of Cattaneo-Mindlin, Savkoor, Persson
11. Applications of contact mechanics

#### The student

- knows models for smooth and rough surfaces under non-adhesive and adhesive conditions and understands their strengths and limits
- knows fundamental scaling relations for the functional dependency between contact area, stiffness and normal force
- can apply numerical methods to study questions from materials science

preliminary knowledge in mathematics, physics and materials science recommended

regular attendance: 22,5 hours

self-study: 97,5 hours

oral exam ca. 30 minutes

**Literature**

K. L. Johnson, Contact Mechanics (Cambridge University Press, 1985)

D. Maugis, Contact, Adhesion and Rupture of Elastic Solids (Springer-Verlag, 2000)

J. Israelachvili, Intermolecular and Surface Forces (Academic Press, 1985)

## T


**3.53 Course: Continuum Mechanics of Solids and Fluids [T-MACH-110377]**

**Responsible:** Prof. Dr.-Ing. Thomas Böhlke  
Prof. Dr.-Ing. Bettina Frohnäpfel

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each winter term	1 terms	5

Events					
WT 24/25	2161252	<a href="#">Continuum mechanics of solids and fluids</a>	2 SWS	Lecture / 	Böhlke, Frohnäpfel
Exams					
WT 24/25	76-T-MACH-110377	<a href="#">Continuum mechanics of solids and fluids</a>			Böhlke, Frohnäpfel

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

Written examination (90 min). Additives as announced

**Prerequisites**

Coursework in *Tutorial Continuum Mechanics of Solids and Fluids* (T-MACH-110333) must be passed

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-110333 - Tutorial Continuum Mechanics of Solids and Fluids](#) must have been passed.

**Annotation**

Due to capacity reasons it is possible that not all students of this course can be admitted to the computer tutorials. Students of the bachelor's degree program in mechanical engineering who have chosen the Major Field Continuum Mechanics (SP-Nr 13) and students of the bachelor's degree program in material science and material technology will be admitted to the computer tutorials in any case.

If additional places are available in the computer tutorials for this course, these will be allocated according to the BSc average grade.

**Workload**

90 hours

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

## V

**Continuum mechanics of solids and fluids**

2161252, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

- introduction into tensor calculus
- kinematics
- balance laws of mechanics and thermodynamics
- material theory of solids and fluids
- field equations for solids and fluids
- thermomechanical couplings
- dimensional analysis

**Literature**

Vorlesungsskript

Greve, R.: Kontinuumsmechanik, Springer 2003

Liu, I-S.: Continuum Mechanics. Springer, 2002

Schade, H.: Strömungslehre, de Gruyter 2013



## T

**3.54 Course: Control of Mobile Machines [T-MACH-111821]**

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

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	3

Exams				
ST 2025	76-T-MACH-111821	<a href="#">Control of mobile machines</a>	Becker, 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**

A prerequisite for participation in the examination is the preparation of a semester report. T-MACH-111820 must be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-111820 - Control of Mobile Machines – Prerequisites](#) must have been passed.

**Workload**

120 hours

**T****3.55 Course: Control of Mobile Machines – Prerequisites [T-MACH-111820]**

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

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	0	pass/fail	Each summer term	1

Exams			
ST 2025	76-T-MACH-111820	<a href="#">Control of mobile machines - Advance</a>	Becker, Geimer

**Competence Certificate**

Preparation of a report on the completion of the semester task


**Prerequisites**





none

## T

**3.56 Course: Control Technology [T-MACH-105185]****Responsible:** Hon.-Prof. Dr. Christoph Gönnheimer**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	2

Events					
ST 2025	2150683	<a href="#">Control Technology</a>	2 SWS	Lecture / 	Gönnheimer
Exams					
WT 24/25	76-T-MACH-105185	<a href="#">Control Technology</a>			Gönnheimer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Written Exam (60 min)

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Control Technology**2150683, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
On-Site**

**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
- Distributed control systems
- Field bus
- Trends in the area of control technology

**Learning Outcomes:**

The students ...

- are able to name the electrical controls which occur in the industrial environment and explain their function.
- can explain fundamental methods of signal processing. This involves in particular several coding methods, error protection methods and analog to digital conversion.
- are able to choose and to dimension control components, including sensors and actors, for an industrial application, particularly in the field of plant engineering and machine tools. Thereby, they can consider both, technical and economical issues.
- can describe the approach for projecting and writing software programs for a programmable logic control named Simatic S7 from Siemens. Thereby they can name several programming languages of the IEC 1131.

**Workload:**

regular attendance: 21 hours

self-study: 99 hours

**Organizational issues**

Zur Vertiefung des im Rahmen der Lehrveranstaltung erworbenen Wissens werden die theoretischen Vorlesungseinheiten durch Praxiseinheiten im Umfeld der Karlsruher Forschungsfabrik (<https://www.karlsruher-forschungsfabrik.de>) unterstützt.

The theoretical lectures are complemented by practical lectures in the Karlsruhe Research Factory (<https://www.karlsruher-forschungsfabrik.de/en.html>) to deepen the acquired knowledge.

**Literature****Medien:**

Skript zur Veranstaltung wird über ilias (<https://ilias.studium.kit.edu/>) bereitgestellt.



**Media:**





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

## T

## 3.57 Course: Cryogenic Engineering [T-CIWVT-108915]

**Responsible:** Prof. Dr.-Ing. Steffen Grohmann**Organisation:** KIT Department of Chemical and Process Engineering**Part of:** [M-MACH-105100 - Courses of the KIT Department of Chemical and Process Engineering](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2250140	<a href="#">Cryogenic Engineering</a>	2 SWS	Lecture / 	Grohmann
WT 24/25	2250141	<a href="#">Cryogenic Engineering - Exercises</a>	1 SWS	Practice / 	Grohmann
Exams					
WT 24/25	7250140	<a href="#">Cryogenic Engineering</a>			Grohmann
ST 2025	7200201	<a href="#">Cryogenic Engineering</a>			Grohmann

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

The examination is an oral examination with a duration of about 30 minutes (section 4 subsection 2 number 2 SPO).

**Prerequisites**

None

## T


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

**Responsible:** Stefan Meisenbacher  
apl. Prof. Dr. Ralf Mikut  
apl. Prof. Dr. Markus Reischl

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each summer term	2

Events					
ST 2025	2106014	<a href="#">Data Analytics for Engineers</a>	3 SWS	Lecture / Practice ( /  )	Mikut, Reischl, Meisenbacher
Exams					
WT 24/25	76-T-MACH-105694	<a href="#">Data Analytics for Engineers</a>	Mikut		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Written exam (Duration: 1h)

**Prerequisites**

none

**Workload**

150 hours

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

## V

**Data Analytics for Engineers**

2106014, SS 2025, 3 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)  
Blended (On-Site/Online)**

**Content****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 SciXMiner and Python): Data import, benchmark datasets, control of hand prostheses, energy prediction
- 2 hours per week lectures, 1 hour per week computer training

**Learning objectives:**

The students are able to apply the methods of data analysis efficiently. They know the basic mathematical data mining foundations for the analysis of single features and time series using classifiers, clustering and regression approaches. They are able to use various relevant methods as Bayes classifiers, Support Vector Machines, decision trees, fuzzy rulebases and they can adapt application scenarios (with data preprocessing and validation techniques) to real-world applications.

**Literature**

Vorlesungsunterlagen (ILIAS)

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

2008 (PDF frei im 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 SciXMiner. Techn. Ber., Forschungszentrum Karlsruhe GmbH. 2006 (Internet)

**T****3.59 Course: Decision-Making and Motion Planning for Automated Driving [T-MACH-113597]**

**Responsible:** Dr.-Ing. Maximilian Naumann  
apl. Prof. Dr. Moritz Werling

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Written examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2137401	<a href="#">Decision-Making and Motion Planning for Automated Driving</a>	3 SWS	Lecture / 	Naumann, Werling
Exams					
WT 24/25	76T-MACH-113597_eng	<a href="#">Decision-Making and Motion Planning for Automated Driving</a>	Stiller		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written examination, duration 60 min.

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

**Prerequisites**

none

**Annotation**

Basic knowledge of control engineering and systems theory should be available from "Measurement and Control Systems" or from other lectures.

**Workload**

180 hours

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

**V****Decision-Making and Motion Planning for Automated Driving**

2137401, WS 24/25, 3 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**



**Content****Kurzfassung (EN):**

Driver assistance is on its way to evolve from pure driving dynamics control systems, such as ABS or ESP, to full automation. To realize new, customer-value safety and comfort systems, the primary task of active driving interventions in steering, accelerator and braking is shifting from the so-called vehicle stabilization level to the so-called vehicle guidance level, the new subject area of modern assistance systems. The challenge here is to provide optimum support for the driver without patronizing him. The next step is driving automation, in which the driving task is completely taken over, at least in certain situations. For highly and fully automated vehicles, the challenge is to produce pleasant, safe and predictable driving behavior under given uncertainties in the perception of the environment and the behavior of other road users.

**Lernziele (EN):**

The lecture is aimed at students of mechanical engineering and related courses who wish to acquire interdisciplinary qualifications in a future-oriented subject area. It covers control engineering, information technology and vehicle technology aspects and provides a holistic overview of the field of automated vehicle control. Practical application examples from innovative driver assistance and driving automation systems deepen and illustrate the lecture content.

**Contents:***Part 1: Driver Assistance:*

- 1) Introduction to driver assistance
- 2) System description and modeling
- 3) Assistance systems of the stabilization level
- 4) Assistance systems of the command level

*Part 2: Driving Automation:*

- 5) Introduction Maneuver Planning
- 6) Dynamic Programming
- 7) Linear-quadratic optimization problems
- 8) Model predictive control
- 9) Decision making under uncertainty (MDPs, reinforcement learning, imitation learning).

**Prerequisites:**

Basic knowledge of control engineering and systems theory should be available from "Measurement and Control Systems" or from lectures of other departments.

Nachweis: written exam

Arbeitsaufwand: 180 hours

**Organizational issues**

Die Vorlesung ist die Nachfolgevorlesung von LV 2138336 Verhaltensgenerierung für Fahrzeuge.


## T




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

**Responsible:** Prof. Dr.-Ing. Marcus Geimer  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

Events					
WT 24/25	2113079	<a href="#">Design and Development of Mobile Machines</a>	2 SWS	Lecture / 	Geimer
Exams					
WT 24/25	76-T-MACH-105311	<a href="#">Design and Development of Mobile Machines</a>			Geimer
ST 2025	76-T-MACH-105311	<a href="#">Design and Development of Mobile Machines</a>			Geimer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**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 interesting lectures of professionals from leading hydraulic companies.

**Prerequisites**

Required for the participation in the examination is the preparation of a report during the semester. 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

**Annotation**

After completion of the lecture, students 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 successfully
- analyse a mobile machines and break its structure down from a complex system to subsystems with reduced complexity
- identify and describe interactions and links between subsystems of a mobile machine
- present and document solutions of a technical problem according to R&D standards

The number of participants is limited.

**Content:**

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 criteria 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 addressed. To do so, an exemplary mobile machine will be discussed and designed in the lecture as a semester project.

**Literature:**

See german recommendations

**Workload**

120 hours

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

**V****Design and Development of Mobile Machines**2113079, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
On-Site****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 being thought. This includes among others:

- Defining the size and dimensions,
- the dimensioning of the electric drive train,
- the dimensioning of the primary energy supply,
- 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.

**Recommendations:**

Knowledge in Fluid Technology (SoSe, LV 21093)

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

**Literature**

Keine.

**T****3.61 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	0	pass/fail	Each term	1

Exams			
WT 24/25	76-T-MACH-108887	<a href="#">Design and Development of Mobile Machines - Advance</a>	Geimer
ST 2025	76-T-MACH-108887	<a href="#">Design and Development of Mobile Machines - Advance</a>	Geimer

**Competence Certificate**

Preparation of semester report


**Prerequisites**





none

## T

**3.62 Course: Design and Optimization of Conventional and Electrified Automotive Transmissions [T-MACH-110958]****Responsible:** Dr.-Ing. Hartmut Faust**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2146208	<a href="#">Design and Optimization of Conventional and Electrified Automotive Transmissions</a>	2 SWS	Lecture / 	Faust

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam (20 min)

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Design and Optimization of Conventional and Electrified Automotive Transmissions****Lecture (V)  
On-Site**2146208, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Content**

- Transmission types: Manual (MT) & automated manual transmissions (AMT), planetary torque converter machines (AT), double clutch (DCT), continuously variable (CVT) and geared neutral transmissions (IVT), hybrid transmissions (serial, parallel, multimode, Powersplit hybrid), E-axes
- Torsional vibration damper: damped clutch disc, dual mass flywheel, centrifugal pendulum (FKP), lock-up damper for torque converter
- Starting elements: dry single clutch, dry and wet double clutch, hydrodynamic torque converter, special shapes, e-motor
- Power transmission: countershaft transmission, planetary gear set, CVT variator, chain, synchronization, shift and claw clutches, reversing, differentials and locking systems, coaxial and axially parallel E-axis drives
- Transmission control: shift systems for MT, actuators for clutches and gear shifting, hydraulic control, electronic control, software application, comfort and sportiness
- Special designs: drive trains of commercial vehicles, hydrostat with power split, torque vectoring
- E-mobility: Classification into 5 stages of electrification, 4 hybrid configurations, 7 parallel hybrid architectures, hybridized transmissions (P2, P2.5, P3, P4), dedicated hybrid transmissions (DHT; serial / parallel / multimode, powersplit, new ones Concepts), gearbox for electric vehicles (E-axle gearbox, coaxial and axially parallel)

**Organizational issues****Die Vorlesung wird als Blockvorlesung, in voraussichtlich etwa 14-tägigen Rhythmus gehalten. Genaue Termine und weitere Infos:** [http://www.ipek.kit.edu/70\\_2819.php](http://www.ipek.kit.edu/70_2819.php)**Lernziele**

Die Studenten erwerben das Wissen aus aktuellen Getriebe-, Hybrid- und reinen Elektroantriebs-Entwicklungen über ...

- die Funktionsweise und Auslegung von konventionellen und elektrifizierten Fahrzeuggetrieben und deren Komponenten;
- Konstruktions- und Funktionsprinzipien der wichtigsten Komponenten von Handschalt-, Doppelkupplungs-, stufenlosen und Planetenautomat-Getrieben;
- komfortrelevante Zusammenhänge und Abhilfemaßnahmen;
- die Hybridisierung und Elektrifizierung der Triebstränge auf Basis bekannter Getriebetypen und mit speziellen sogenannten Dedicated Hybrid Transmissions (DHT) sowie Bewertung der Konzepte auf Systemebene.

## T


## 3.63 Course: Design of a Jet Engine Combustion Chamber [T-CIWVT-110571]





**Responsible:** Dr.-Ing. Stefan Raphael Harth

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** [M-MACH-105100 - Courses of the KIT Department of Chemical and Process Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	6	Grade to a third	Each winter term	1

Events					
WT 24/25	2232310	<a href="#">Design of a Jet Engine Combustion Chamber</a>	2 SWS	/ 	Harth
Exams					
WT 24/25	7232310	<a href="#">Design of a Jet Engine Combustion Chamber</a>			Harth
ST 2025	7232310	<a href="#">Design of a Gas Turbine Combustor</a>			Harth

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

Success control is an examination of another kind according to § 4 Abs. 2 Nr. 3 SPO.


Project: Participation and presentation as well as a final oral examination amounting to max. 30 minutes.





### Prerequisites

None

## T

**3.64 Course: Design of Highly Stressed Components [T-MACH-105310]****Responsible:** apl. Prof. Dr. Jarir Aktaa**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2181745	<a href="#">Design of highly stressed components</a>	2 SWS	Lecture / 	Aktaa
Exams					
WT 24/25	76-T-MACH-105310	<a href="#">Design of Highly Stressed Components</a>			Aktaa
ST 2025	76-T-MACH-105310	<a href="#">Design of Highly Stresses Components</a>			Aktaa

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam ca 30 minutes

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Design of highly stressed components**2181745, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

Contents of the lecture:

rules of common design codes

classical models for elasto-plasticity and creep

lifetime rules for creep, fatigue and creep-fatigue interaction

unified constitutive models for thermo-elasto-viscoplasticity

continuum mechanical models for damage at high temperatures

application of advanced material models in FE-codes

The students know about the rules of established design codes for the assessment of components which under operation are subjected to high thermo-mechanical and/or irradiation loadings. They understand which constitutive equations are used according to state-of-the-art of technology and research to estimate deformation and damage appearing under these loadings and to predict expected lifetime. They gained insight into the application of these generally non-linear constitutive equations in finite element codes and can judge the major issues which shall be thereby taken into account.

Qualification: Materials Science, solid mechanics II

regular attendance: 22,5 hours

self-study: 97,5 hours

oral exam ca. 30 minutes

**Organizational issues**


Die Vorlesung findet ab dem 29.10.2024 statt





**Literature**

Viswanathan, Damage Mechanisms and Life Assessment of High-Temperature Components, ASM International, 1989.

Lemaitre, J.; Chaboche J.L.: Mechanics of Solid Materials, Cambridge University Press, Cambridge, 1990.

**T****3.65 Course: Design with Plastics [T-MACH-105330]****Responsible:** Dipl.-Ing. Markus Liedel**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
1

Events					
ST 2025	2174571	<a href="#">Design with Plastics</a>	2 SWS	Block / 	Liedel
Exams					
ST 2025	76-T-MACH-105330	<a href="#">Design with Plastics</a>	Liedel		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral exam, about 20 minutes

**Prerequisites**

none

**Recommendation**

Poly I

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Design with Plastics**2174571, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Block (B)**  
**On-Site**



**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.

**learning objectives:**

Students will be able to

- distinguish polymer compounds from other construction materials regarding chemical differences, thermal behavior and solid conditions.
- discuss main plastics processes regarding advantages and disadvantages of materials selection and part geometry design and to make appropriate selections.
- analyze complex application requirements concerning material impacts on strength and to use the classic dimensioning method specific to the application to evaluate the lifetime part strength limit.
- evaluate part tolerances and geometry by appropriate methods considering molding shrinkage, production tolerances, post shrinkage, heat expansion, swelling, elastic and creep deformation.
- design plastic specific joining geometries like snap fits, screw bosses, weld seams and film hinges.
- detect classic molding failures and understand potential causes as well as to reduce the probability of molding failures by defining an optimized design.
- understand benefits and limits of selected simulation tools in the plastic technology discipline (strength, deformation, filling, warpage).
- assess polymer classes and plastic part designs with respect to suitable recycling concepts and ecological consequences.

**requirements:**

none,

recommendation: Polymerengineering I

**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).

**Organizational issues**

Anmeldung unter [Markus.Liedel@de.bosch.com](mailto:Markus.Liedel@de.bosch.com)

**Literature**

Materialien werden in der Vorlesung ausgegeben.  
Literaturhinweise werden in der Vorlesung gegeben.

## T

**3.66 Course: Designing with Composites [T-MACH-108721]****Responsible:** Prof. Dr. Eckart Schnack**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

**Competence Certificate**

Oral exam, 20 minutes

**Prerequisites**

None

**Annotation**

The lecture notes are made available via ILIAS.

**Workload**

120 hours

## T


**3.67 Course: Development of Oil-Hydraulic Powertrain Systems [T-MACH-105441]**





**Responsible:** Dr.-Ing. Gerhard Geerling  
Prof. Dr.-Ing. Marcus Geimer

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

Events					
WT 24/25	2113072	<a href="#">Development of Oil-Hydraulic Powertrain Systems</a>	2 SWS	Block / 	Geerling
Exams					
WT 24/25	76-T-MACH-105441	<a href="#">Development of Oil-Hydraulic Powertrain Systems</a>	Geimer		
ST 2025	76-T-MACH-105441	<a href="#">Development of Oil-Hydraulic Powertrain Systems</a>	Geimer		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

oral exam (approx. 20 min)

### Prerequisites

none

### Workload

120 hours

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

## V

**Development of Oil-Hydraulic Powertrain Systems**

2113072, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Block (B)  
On-Site**

### 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

knowledge in the fluidics

- regular attendance: 19 hours
- self-study: 90 hours

### Organizational issues

siehe Homepage

**T****3.68 Course: Differential Equations - Exam [T-MATH-103323]**

**Responsible:** PD Dr. Volker Grimm  
 Prof. Dr. Marlis Hochbruck  
 PD Dr. Markus Neher

**Organisation:** KIT Department of Mathematics

**Part of:** [M-MACH-104885 - Courses of the KIT Department of Mathematics](#)



**Type**  
Written examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 24/25	0132200	<a href="#">Advanced Mathematics 3 for the Functional Direction Civil Engineering: Differential equations</a>	2 SWS	Lecture / 	Neher
WT 24/25	0132300	<a href="#">Exercises to Advanced Mathematics 3 for the Functional Direction Civil Engineering: Differential equations</a>	1 SWS	Practice / 	Neher
Exams					
WT 24/25	01015866090800808_HM3_Bau-Ing.	<a href="#">Advanced Mathematics 3 for the Course of Studies Civil Engineering: Differential Equations - Exam</a>			Hochbruck

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

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

**V**

**Advanced Mathematics 3 for the Functional Direction Civil Engineering: Differential equations**

0132200, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
On-Site

**V**

**Exercises to Advanced Mathematics 3 for the Functional Direction Civil Engineering: Differential equations**

0132300, WS 24/25, 1 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)**  
On-Site

**3.69 Course: Digital Control [T-MACH-105317]**

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

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Written examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2137309	<a href="#">Digital Control</a>	2 SWS	Lecture /	Knoop, Rack
Exams					
WT 24/25	76-T-MACH-105317	<a href="#">Digital Control</a>			Knoop, Stiller

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

written exam

60 min.

**Prerequisites**

none

**Workload**

120 hours

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

**Digital Control**

2137309, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content****Lehrinhalt (EN):**

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

**Voraussetzungen (EN):**

Basic studies and preliminary examination; basic lectures in automatic control

**Lernziele (EN):**

The lecture introduces key methods for the analysis and design of digital feedback control systems. Starting point is the discretisation of linear, continuous-time models. State space based and z-transform based controller design techniques are presented for discrete-time, single-input single-output systems. Furthermore, plants with dead-time and deadbeat design are covered.

Nachweis: oral examination; duration: 30 minutes

Arbeitsaufwand: 120 hours

**Literature**

- Lunze, J.: Regelungstechnik 2, 9. Auflage, Springer Verlag, Berlin Heidelberg 2016.
- 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

## T

## 3.70 Course: Digital Technology [T-ETIT-101918]

**Responsible:** Prof. Dr.-Ing. Jürgen Becker**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2311613	<a href="#">Accompanying group tutorial for 2311615 Digital Technology / Fundamentals of Digital Technology</a>	1 SWS	Tutorial ( / 🎧)	Höfer, Gutermann
WT 24/25	2311615	<a href="#">Digital Technology / Fundamentals of Digital Technology</a>	3 SWS	Lecture / 🎧	Becker
WT 24/25	2311617	<a href="#">Tutorial for 2311615 Digital Technology / Fundamentals of Digital Technology</a>	1 SWS	Practice / 🎧	Gutermann, Höfer
Exams					
WT 24/25	7311615	<a href="#">Digital Technology</a>			Becker

Legend: 📺 Online, 🎧 Blended (On-Site/Online), 🎧 On-Site, ✕ Cancelled


**Prerequisites**




none

## T

**3.71 Course: Digitization in the Railway System [T-MACH-113016]****Responsible:** Prof. Dr.-Ing. Martin Cichon**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	4	Grade to a third	Each winter term	1 terms	2

Events					
WT 24/25	2115920	<a href="#">Railway System Digitalisation</a>	2 SWS	Lecture / 	Jost, Cichon
Exams					
WT 24/25	76-T-MACH-106426	<a href="#">Railway System Digitalisation</a>	Jost		

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

Oral examination

Duration: approx. 20 minutes

No tools or reference material may be used during the exam.

**Workload**

120 hours

**T****3.72 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	2	Grade to a third	Each winter term	1

**Competence Certificate**

Oral examination, time duration 30 min., no aids

**Prerequisites**

none



**Workload**





60 hours



## T

**3.73 Course: Drive Train of Mobile Machines [T-MACH-105307]****Responsible:** Prof. Dr.-Ing. Marcus Geimer**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2113077	<a href="#">Drive Train of Mobile Machines</a>	2 SWS	Lecture / 	Geimer
WT 24/25	2113078	<a href="#">Exercise Drivetrain of Mobile Machines</a>	1 SWS	Practice / 	Geimer, Bargaen-Herzog
Exams					
WT 24/25	76-T-MACH-105307	<a href="#">Drive Train of Mobile Machines</a>			Geimer
ST 2025	76-T-MACH-105307	<a href="#">Drive Train of Mobile Machines</a>			Geimer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

The final assessment will be an oral examination (20 min) taking place during the recess period. The examination will be offered in every 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.**Workload**

120 hours

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

## V

**Drive Train of Mobile Machines**2113077, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site**

**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

**Recommendations:**

- general basics of mechanical engineering
- basic knowledge in hydraulics
- interest in mobile machines
  
- regular attendance: 21 hours
- self-study: 89 hours

**Literature**

Skriptum zur Vorlesung downloadbar über ILIAS

## T

**3.74 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
3**Exams**

WT 24/25	76-T-MACH-105226	<a href="#">Dynamics of the Automotive Drive Train</a>	Fidlin
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**Competence Certificate**

Oral examination, 30 min.

**Prerequisites**

none

**Recommendation**

Powertrain Systems Technology A: Automotive SystemsMachine DynamicsVibration Theory

**Workload**

120 hours

## T

**3.75 Course: Elasticity as a Field Theory [T-MACH-112215]**

**Responsible:** Dr. Eleni Agiasofitou  
Dr. Markus Lazar

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	1

**Competence Certificate**

written exam (90 min)

**Workload**

120 hours

## T





## 3.76 Course: Electric Energy Systems [T-ETIT-101923]





**Responsible:** Prof. Dr.-Ing. Thomas Leibfried

**Organisation:** KIT Department of Electrical Engineering and Information Technology

**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each summer term	2

Events					
ST 2025	2306200	<a href="#">Electric Energy Systems</a>	2 SWS	Lecture / 	Hiller, Leibfried
ST 2025	2306201	<a href="#">Practice to Electric Energy Systems</a>	2 SWS	Practice / 	Hiller, Leibfried
ST 2025	2307391	<a href="#">Electric Energy Systems</a>	2 SWS	Lecture / 	Leibfried
ST 2025	2307393	<a href="#">Übungen zu 2307391</a> <a href="#">Elektroenergiesysteme</a>	1 SWS	Practice / 	Eser
Exams					
WT 24/25	7307391	<a href="#">Electric Energy Systems</a>	Leibfried		


Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled





#### Prerequisites

none

## T

**3.77 Course: Electric Power Generation and Power Grid [T-ETIT-103608]****Responsible:** Dr.-Ing. Bernd Hoferer**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2307399	<a href="#">Electric Power Generation and Power Grid</a>	2 SWS	Lecture / 	Hoferer
Exams					
WT 24/25	7307399	<a href="#">Electric Power Generation and Power Grid</a>			Hoferer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Prerequisites**

none

## T

**3.78 Course: Electric Power Transmission & Grid Control [T-ETIT-110883]****Responsible:** Prof. Dr.-Ing. Thomas Leibfried**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each summer term	1 terms	2

Events					
WT 24/25	2307376	<a href="#">Electric Power Transmission &amp; Grid Control</a>	2 SWS	Lecture / ✕	Leibfried
ST 2025	2307376	<a href="#">Electric Power Transmission &amp; Grid Control</a>	2 SWS	Lecture / 🎧	Leibfried
ST 2025	2307377	<a href="#">Tutorial for 2307376 Electric Power Transmission &amp; Grid Control</a>	2 SWS	Practice / 🎧	Weber

Legend: 📺 Online, 🎧 Blended (On-Site/Online), 🎧 On-Site, ✕ Cancelled

**Competence Certificate**




The examination takes place in form of a written examination lasting 120 minutes. The module grade is the grade of the written exam.

**Prerequisites**

none

**T****3.79 Course: Electrical Engineering and Electronics [T-ETIT-109820]****Responsible:** Prof. Dr. Martin Doppelbauer**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Written examination**Credits**  
8**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2306339	<a href="#">Electrical Engineering and Electronics for Mechanical Engineers</a>	4 SWS	Lecture / ✕	Brodatzki
WT 24/25	2306340	<a href="#">Electrical Engineering and Electronics for Mechanical Engineers</a>	2 SWS	Practice / ✕	Digel, Bremer
Exams					
WT 24/25	7306351	<a href="#">Electrical Engineering and Electronics for Mechanical Engineers</a>	Doppelbauer		
ST 2025	7306351	<a href="#">Electrical Engineering and Electronics for Mechanical Engineers</a>	Brodatzki		



Legend:  Online,  Blended (On-Site/Online),  On-Site, ✕ Cancelled**Annotation**





Exam will be held in german language



## T

**3.80 Course: Electrical Engineering and Electronics [T-ETIT-108386]****Responsible:** Prof. Dr.-Ing. Giovanni De Carne**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Written examination**Credits**  
8**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2306350	<a href="#">Electrical Engineering and Electronics for Mechanical Engineers</a>	4 SWS	Lecture / 	De Carne
WT 24/25	2306351	<a href="#">Tutorial for 2306350 Electrical Engineering and Electronics for Mechanical Engineers</a>	2 SWS	Practice / 	De Carne, Digel, Bremer, Brodatzki
Exams					
WT 24/25	7306350	<a href="#">Electrical Engineering and Electronics for Mechanical Engineers</a>	Doppelbauer		
ST 2025	7306350	<a href="#">Electrical Engineering and Electronics for Mechanical Engineers</a>	Brodatzki		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

The control of success takes place by a written examination, duration 3 hours.

By successfully completing two additional exercise sheets (on a voluntary basis), a bonus of up to 6 exam points can be earned (corresponds to a maximum grade improvement of the written exam by the value 0.3 or 0.4).

**Prerequisites**



none




**Annotation**

Exam will be held in english language.

## T

**3.81 Course: Electrical Machines and Power Electronics [T-ETIT-101954]****Responsible:** Prof. Dr.-Ing. Marc Hiller**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1




Events					
WT 24/25	2306387	<a href="#">Electrical Machines and Power Electronics</a>	2 SWS	Lecture / 	Hiller
WT 24/25	2306389	<a href="#">Tutorial for 2306387 Electrical Machines and Power Electronics</a>	2 SWS	Practice / 	Hiller
Exams					
WT 24/25	7306307	<a href="#">Electrical Machines and Power Electronics</a>			Hiller





Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Prerequisites**

none

## T

**3.82 Course: Electronic Devices and Circuits [T-ETIT-109318]****Responsible:** Prof. Dr.-Ing. Ahmet Cagri Ulusoy**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Expansion**  
1 terms**Version**  
2

Events					
ST 2025	2308655	<a href="#">Electronic Devices and Circuits</a>	3 SWS	Lecture / 	Ulusoy
ST 2025	2308657	<a href="#">Übungen zu 2312655 Elektronische Schaltungen</a>	1 SWS	Practice / 	Ulusoy
ST 2025	2308658	<a href="#">Tutorien zu 2312655 Elektronische Schaltungen</a>	1 SWS	/ 	Ulusoy
Exams					
WT 24/25	7308655	<a href="#">Electronic Devices and Circuits</a>			Ulusoy

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Prerequisites**

none

## T

**3.83 Course: Energy and Process Technology I [T-MACH-102211]**

**Responsible:** Prof. Dr.-Ing. Hans-Jörg Bauer  
 Prof. Dr. Ulrich Maas  
 Dr.-Ing. Corina Schwitzke  
 Dr. Amin Velji

**Organisation:** KIT Department of Mechanical Engineering

Institute of Thermal Turbomachinery

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Written examination

**Credits**  
9

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

**Events**

WT 24/25	2157961	<a href="#">Energy and Process Technology I</a>	6 SWS	Lecture / Practice ( / ) ●	Bauer, Mitarbeiter, Wagner, Maas, Schwitzke, Wirbser, Reichel
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**Exams**

WT 24/25	76-T-MACH-102211	<a href="#">Energy and Process Technology I</a>	Bauer, Wirbser, Schwitzke, Wagner		
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Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

The assessment consists of a written exam (120 minutes) (following §4(2), 1 of the examination regulation).

**Prerequisites**

none

**Workload**

270 hours

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

## V

**Energy and Process Technology I**

2157961, WS 24/25, 6 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)**  
**On-Site**

**Content**

The last third of the lecture deals with the topic **Thermal Turbomachinery**. The basic principles, the functionality and the scope of application of gas and steam turbines for the generation of electrical power and propulsion technology are addressed.

The students are able to:

- describe and calculate the basic physical-technical processes
- apply the mathematical and thermodynamical description
- reflect on and explain the diagrams and schematics
- comment on diagrams
- explain the functionality of gas and steam turbines and their components
- name the applications of thermal turbomachinery and their role in the field of electricity generation and propulsion technology

## T

**3.84 Course: Energy and Process Technology II [T-MACH-102212]**

**Responsible:** Prof. Dr. Ulrich Maas  
Dr.-Ing. Corina Schwitzke

**Organisation:** KIT Department of Mechanical Engineering

Institute of Thermal Turbomachinery

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	9	Grade to a third	Each summer term	1

Exams				
WT 24/25	76-T-MACH-102212	<a href="#">Energy and Process Technology II</a>		Schwitzke, Wirbser, Bauer, Wagner

**Competence Certificate**

The assessment consists of a written exam (120 minutes) (following §4(2), 1 of the examination regulation).

**Prerequisites**

none

**Workload**

270 hours

**T****3.85 Course: Energy Conversion and Increased Efficiency in Internal Combustion Engines [T-MACH-105564]**

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

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Exams			
WT 24/25	76-T-MACH-105564	<a href="#">Energy Conversion and Increased Efficiency in Internal Combustion Engines</a>	Koch

**Competence Certificate**

oral exam, 25 minutes, no auxiliary means

**Prerequisites**

none

**T****3.86 Course: Energy from Biomass [T-CIWVT-110576]**

**Responsible:** Dr.-Ing. Siegfried Bajohr  
Prof. Dr. Nicolaus Dahmen

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** [M-MACH-105100 - Courses of the KIT Department of Chemical and Process Engineering](#)


**Type**  
Written examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	2231220	<a href="#">Energy from Biomass</a>	2 SWS	Lecture / 	Dahmen, Bajohr
Exams					
WT 24/25	7233102	<a href="#">Energy from Biomass</a>			Dahmen, Bajohr

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

The examination is a written examination with a duration of 90 minutes (section 4 subsection 2 number 1 SPO).

**Prerequisites**



None





## T

## 3.87 Course: Energy Market Engineering [T-WIWI-107501]

**Responsible:** Prof. Dr. Christof Weinhardt**Organisation:** KIT Department of Economics and Management**Part of:** [M-MACH-104884 - Courses of the KIT Department of Economics and Management](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4,5	Grade to a third	Each summer term	1

Events					
ST 2025	2540464	<a href="#">Energy Market Engineering</a>	2 SWS	Lecture / 	Weinhardt, Miskiw
ST 2025	2540465	<a href="#">Übung zu Energy Market Engineering</a>	1 SWS	Practice / 	Semmelmann
Exams					
WT 24/25	7900127	<a href="#">Energy Market Engineering</a>	Weinhardt		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

The assessment consists of a written exam (60 min) (according to §4(2), 1 of the examination regulations). By successful completion of the exercises (§4 (2), 3 SPO 2007 respectively §4 (3) SPO 2015) a bonus can be obtained. If the grade of the written exam is at least 4.0 and at most 1.3, the bonus will improve it by one grade level (i.e. by 0.3 or 0.4).

**Prerequisites**

None

**Recommendation**

None

**Annotation**

Former course title until summer term 2017: T-WIWI-102794 "eEnergy: Markets, Services, Systems".

The lecture has also been added in the IIP Module *Basics of Liberalised Energy Markets*.

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

## V

**Energy Market Engineering**2540464, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**Blended (On-Site/Online)****Content**

The lecture "Energy Market Engineering" addresses the design and analysis of energy markets considering current developments and challenges. A particular focus is on the integration of renewable energies and the associated market mechanisms and regulations.

Specifically, the following topics are covered:

- **Introduction to Market Engineering:** What design elements do markets and specifically auctions have in general, and what influence does this have on participant behavior.
- **Introduction to Energy Markets:** Fundamentals and current trends in the energy system, including climate change and the expansion of renewable energies.
- **Market Design and Products:** Various pricing models such as nodal pricing, zonal pricing, and the structure of capacity markets.
- **Grid Expansion, Distribution Networks, and Flexibility Markets:** Analysis of distribution network markets and the role of flexibility options like demand response and storage technologies.
- **Intermittent Generation and Grid Stability:** Challenges posed by fluctuating renewable energies and strategies to ensure grid stability.
- **Digitalization and Market Transparency:** The role of digitalization in improving market transparency and efficiency, including the use of smart metering systems and data-driven approaches.
- **Current Research Projects and Developments:** Presentation of ongoing research projects and their significance for the future design of energy markets.




**Literature**

- Erdmann G, Zweifel P. *Energieökonomik, Theorie und Anwendungen*. Berlin Heidelberg: Springer; 2007.
- Grimm V, Ockenfels A, Zoettl G. Strommarktdesign: Zur Ausgestaltung der Auktionsregeln an der EEX \*. *Zeitschrift für Energiewirtschaft*. 2008:147-161.
- Stoft S. *Power System Economics: Designing Markets for Electricity*. IEEE; 2002.,
- Ströbele W, Pfaffenberger W, Heuterkes M. *Energiewirtschaft: Einführung in Theorie und Politik*. 2nd ed. München: Oldenbourg Verlag; 2010:349.

## T

**3.88 Course: Energy Storage and Network Integration [T-MACH-105952]****Responsible:** Dr. Ferdinand Schmidt**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

Events					
WT 24/25	2189487	<a href="#">Energy Storage and Grid Integration</a>	2 SWS	Lecture / 	Schmidt
Exams					
WT 24/25	76-T-MACH-105952	<a href="#">Energy Storage and Grid Integration</a>			Schmidt

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**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.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-ETIT-104644 - Energy Storage and Network Integration](#) must not have been started.

**Workload**

120 hours

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

## V

**Energy Storage and Grid Integration**2189487, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****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.

Students understand the different types of energy storage and apply their knowledge for the selection and principal dimensioning of relevant energy storage tasks.

Furthermore, students can reflect the state-of-the-art of most important energy storage types, their fundamental characteristics and viability at given boundary conditions and they are enabled to elaborate and apply basic integration issues dependent on the grid structure for the different network types.

Oral exam, duration approximately 30 min, tools: none

**Literature**

M. Sterner, I. Stadler: [Energiespeicher - Bedarf, Technologien, Integration](#). Springer 2017, <https://link.springer.com/book/10.1007/978-3-662-48893-5>

## T

**3.89 Course: Energy Storage and Network Integration [T-ETIT-104644]****Responsible:** Prof. Dr.-Ing. Mathias Noe**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2312687	<a href="#">Energy Storage and Network Integration</a>	2 SWS	Lecture / 🗎	Grilli, De Carne
WT 24/25	2312689	<a href="#">Tutorial for 2312687 Energy Storage and Network Integration</a>	1 SWS	Practice / 🗎	De Carne, Grilli
Exams					
WT 24/25	7312687	<a href="#">Energy Storage and Network Integration</a>	Grilli, De Carne		

Legend: 🗎 Online, 🗎 Blended (On-Site/Online), 🗎 On-Site, x Cancelled

**Prerequisites**

Neither participation in "Energiespeicher und Netzintegration" (ETIT) nor in "Energiespeicher und Netzintegration" (MACH). Only one out of these three exams is allowed.

**Recommendation**

Basic knowledge in the fields of Electrical Engineering and Thermodynamics is helpful.

**Annotation**

Exam and Lecture will be held in English.

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

## V

**Tutorial for 2312687 Energy Storage and Network Integration**2312689, WS 24/25, 1 SWS, Language: English, [Open in study portal](#)**Practice (Ü)**  
**On-Site****Content**

Campus North - dates will be announced in the beginning of the semester in the lecture

In order to gain credits, both, the lecture and the tutorial, have to be completed (participation in VL 23687 "Energy Storage and Network Integration").

**Organizational issues**

Please note: First tutorial is 4th November 2024.



### 3.90 Course: Energy Systems I: Renewable Energy [T-MACH-105408]

**Responsible:** apl. Prof. Dr. Ron Dagan

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	2

Events					
WT 24/25	2129901	<a href="#">Energy Systems I - Renewable Energy</a>	2 SWS	Lecture /	Dagan
Exams					
WT 24/25	76-T-MACH-105408	<a href="#">Energy Systems I: Renewable Energy</a>			Dagan
ST 2025	76-T-MACH-105408	<a href="#">Energy Systems I: Renewable Energy</a>			Dagan

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

oral exam, approx. 1/2 hour

#### Prerequisites

none

#### Workload

120 hours

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



#### Energy Systems I - Renewable Energy

2129901, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

The course deals with fundamental aspects of renewable energies.

1. The first part deals with the basic concepts of absorbing solar beams, 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. Introductory aspects of Photovoltaic technologies are illuminated.
3. The last part presents additional regenerative energy sources such as wind and geothermal energy.

The student knows the principles of the feasibility of energy gain by means of renewable energies, in particular the solar energy.

regular attendance: 30 hours

self-study: 90hours

Oral examination – as an elective course 30 minutes, in combination with Energiesysteme-II or other courses within the energy courses, as a major course 1 hour

**3.91 Course: Energy Systems II: Reactor Physics [T-MACH-105550]****Responsible:** Dr. Aurelian Florin Badea**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2130929	<a href="#">Energy systems II: Reactor Physics</a>	2 SWS	Lecture /	Badea
Exams					
WT 24/25	76-T-MACH-105550	<a href="#">Energy Systems II: Reactor Physics</a>			Badea
ST 2025	76-T-MACH-105550	<a href="#">Energy Systems II: Reactor Physics</a>			Badea

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam, 20 min

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***Energy systems II: Reactor Physics**2130929, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
On-Site****Content**

The goal of the course is to train the students for the field of nuclear energy using fission reactors. The students acquire comprehensive knowledge on the physics of nuclear fission reactors: neutron flux, cross sections, fission, breeding processes, chain reaction, critical size of a nuclear system, moderation, reactor dynamics, transport- and diffusion-equation for the neutron flux distribution, power density distributions in reactor, one-group, two-group and multi-group theories for the neutron spectrum. Students are able to analyze and understand the obtained results. Based on the reactor physics knowledge, the students are able to understand, compare and evaluate the capabilities of different types of reactors - LWR, heavy water reactors, nuclear power systems of generation IV – as well as their fundamental nuclear safety concepts. The students are qualified for further training in nuclear energy and safety field and for (also research-related) professional activity in the nuclear industry.

- nuclear fission & fusion,
- radioactive decay, neutron excess, fission, fast and thermal neutrons, fissile and fertile nuclei,
- neutron flux, cross section, reaction rate, mean free path, chain reaction, critical size, moderation,
- reactor dynamics,
- transport- and diffusion-equation for the neutron flux distribution, power distributions in reactor,
- one-group and two-group theories,
- light-water reactors,
- reactor safety,
- design of nuclear reactors,
- breeding processes,
- nuclear power systems of generation IV

**Organizational issues**

Di (29.07.2025), 09:00 bis 17:00

Mi (30.07.2025), 09:00 bis 17:00

Do (31.07.2025), 09:00 bis 17:00

**Literature**

Dieter Schmidt, Reaktortechnik, Band 1: Grundlagen, ISBN 3 7650 2003 6

Dieter Schmidt, Reaktortechnik, Band 2: Anwendungen, ISBN 3 7650 2004 4

## T

**3.92 Course: Engine Laboratory [T-MACH-105337]****Responsible:** Dr.-Ing. Uwe Wagner**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each summer term	2

**Competence Certificate**

written documentation of every experiment, certificate of successful attendance, no grading

**Prerequisites**

T-MACH-114122 must not be started.

**Workload**

120 hours

## T

**3.93 Course: Engine Measurement Techniques [T-MACH-105169]****Responsible:** Dr.-Ing. Sören Bernhardt**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

**Competence Certificate**

oral examination, Duration: 0,5 hours, no auxiliary means

**Prerequisites**

none

**Recommendation**

T-MACH-102194 Combustion Engines I


**Workload**




120 hours



## T

**3.94 Course: Engineering Materials for the Energy Transition [T-MACH-109082]****Responsible:** Prof. Dr. Hans Jürgen Seifert**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
2

Events					
WT 24/25	2193007	<a href="#">Engineering Materials for the Energy Transition</a>	2 SWS	Lecture / 	Seifert, Ziebert
Exams					
WT 24/25	76-T-MACH-109082	<a href="#">Engineering Materials for the Energy Transition</a>			Seifert
ST 2025	76-T-MACH-109082	<a href="#">Engineering Materials for the Energy Transition</a>			Seifert

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

oral exam; about 30 minutes

**Prerequisites**

T-MACH-108688 - The energetics of engineering materials for the energy transition must not have been started.

**Recommendation**

Knowledge of Materials Science.

**Workload**

120 hours

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

## V

**Engineering Materials for the Energy Transition**2193007, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

oral examination (about 30 min)

Recommendations: Knowledge of Materials Science

Workload: 120 hours

**3.95 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each summer term	2

Events					
ST 2025	2162250	<a href="#">Engineering Mechanics II</a>	3 SWS	Lecture /	Böhlke, Langhoff
ST 2025	3162010	<a href="#">Engineering Mechanics II (Lecture)</a>	3 SWS	Lecture /	Langhoff, Böhlke
Exams					
WT 24/25	76-T-MACH-100283	<a href="#">Engineering Mechanics II</a>			Böhlke, Langhoff
WT 24/25	76-T-MACH-100283-englisch	<a href="#">Engineering Mechanics II</a>			Böhlke, Langhoff

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**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.

**Workload**

180 hours

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

**Engineering Mechanics II**

2162250, SS 2025, 3 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**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 of elastic bars

**Literature**

Vorlesungsskript

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.


**V****Engineering Mechanics II (Lecture)**3162010, SS 2025, 3 SWS, Language: English, [Open in study portal](#)**Lecture (V)  
On-Site****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 of elastic bars

## T

**3.96 Course: Engineering Mechanics III [T-MACH-112906]****Responsible:** Prof. Dr.-Ing. Carsten Proppe**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each winter term	1 terms	1

Events					
ST 2025	2161203	<a href="#">Engineering Mechanics III</a>	2 SWS	Lecture / 	Proppe
Exams					
WT 24/25	76-T-MACH-112906	<a href="#">Engineering Mechanics III</a>			Proppe

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Written exam, duration: 180 minutes

**Prerequisites**Coursework in *Tutorial Engineering Mechanics III* (T-MACH-112909) must have been passed**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-112909 - Tutorial Engineering Mechanics III](#) must have been passed.

**Workload**

180 hours

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

## V

**Engineering Mechanics III**2161203, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
Online****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.

**Organizational issues**

Die Lehrveranstaltung TM III (MACH SPO: 2015, MIT SPO: 2016) wird letztmalig im Wintersemester 2023/24 angeboten. Die Lehrinhalte werden zu einem großen Teil ab Wintersemester 2024/25 im Rahmen der TM III (MACH und MIT: SPO 2023) behandelt. Die Vorleistung für Studierende in den alten SPOs (MACH SPO: 2015, MIT SPO: 2016) werden weiterhin in einer angepassten Form angeboten, die zu gegebener Zeit über ILIAS kommuniziert wird.

Für diese Veranstaltung werden online Unterlagen bereitgestellt.

**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****3.97 Course: Engineer's Field of Work [T-MACH-105721]**





**Responsible:** Prof. Dr. Martin Doppelbauer  
Prof. Dr.-Ing. Marcus Geimer

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (written)	2	pass/fail	Each summer term	2

Events					
ST 2025	2114917	<a href="#">Engineer's Field of Work</a>	2 SWS	Lecture / 	Doppelbauer, Geimer
Exams					
WT 24/25	76-T-MACH-105721	<a href="#">Engineer's Field of Work</a>			Geimer, Doppelbauer
ST 2025	76-T-MACH-105721	<a href="#">Engineer's Field of Work</a>			Doppelbauer, Geimer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written test

Duration: 60 minutes

result: passed / not passed

No tools or reference materials may be used during the exam.

**Prerequisites**

none

**Workload**

60 hours

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

**V****Engineer's Field of Work**

2114917, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content****AFI1: Organization of Companies (Marcus Geimer)**

organizational structure, organizational units, managerial structure, organization charts, project organization, relation between superior and staff, board of managing directors, management of the company, supervisory board, advisory board

**AFI 2: Project Management (Marcus Geimer)**

definition of project, project manager, project team, primary processes, supporting processes

**AFI3: Personnel Development (Martin Doppelbauer)**

applications, trainee programs, management career, professional career, career paths in companies, individual career planning, tasks of HR, manpower requirements planning, training, training-on-the-job, tools for human resource management, annual personnel talk, objective agreement

**AFI4: Scheduling (Marcus Geimer)**

Methods for detailed scheduling, network plans, critical path, Gantt-diagram, milestones

**AFI5a/b: Development Processes (Martin Doppelbauer)**

research, advance development, series development, product marketing, V-model, SPALTEN-model, technical specifications, requirement specifications, clarification, concept, draft, elaboration, validation, verification, documentation, FMEA

**AFI6: Standards and Laws (Martin Doppelbauer)**

importance of standards, German and international standardization systems, committees, certification

**AFI7: Commercial Law (Martin Doppelbauer)**

health protection, safety at work, environment protection, product liability, patents

**AFI8: Calculation, Financial Statement (Marcus Geimer)**

contract award estimate, project costing, unit cost, target costs, cost center accounting, cost recording, hourly rates, asset accounting, profit and loss statement



**AFI9: Governance (Marcus Geimer)**





principles of governance (accountability, responsibility, transparency, fairness), leadership (technical, commercial), reviews, boards, audits, codetermination, compliance

## T

## 3.98 Course: Entrepreneurship [T-WIWI-102864]

**Responsible:** Prof. Dr. Orestis Terzidis**Organisation:** KIT Department of Economics and Management**Part of:** [M-MACH-104884 - Courses of the KIT Department of Economics and Management](#)**Type**  
Written examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 24/25	2545001	<a href="#">Entrepreneurship</a>	2 SWS	Lecture / 	Terzidis, Dang
ST 2025	2545001	<a href="#">Entrepreneurship</a>	2 SWS	Lecture / 	Terzidis, Dang
Exams					
WT 24/25	7900045	<a href="#">Entrepreneurship</a>	Terzidis		
WT 24/25	7900229	<a href="#">Entrepreneurship</a>	Terzidis		
ST 2025	7900002	<a href="#">Entrepreneurship</a>	Terzidis		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation).

Students are offered the opportunity to earn a grade bonus through separate assignments. If the grade of the written exam is between 4.0 and 1.3, the bonus improves the grade by a maximum of one grade level (0.3 or 0.4). The exact criteria for awarding a bonus will be announced at the beginning of the lecture.

**Prerequisites**

None

**Recommendation**

None

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

## V

**Entrepreneurship**2545001, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**Blended (On-Site/Online)**



**Content**

The lecture as an obligatory part of the module "Entrepreneurship" introduces the basic concepts of entrepreneurship. Important concepts and empirical facts are presented that relate to the conception and implementation of newly founded companies.

The focus here is on the introduction to methods for generating innovative business ideas, for transferring patents into business concepts and general principles of business modelling and business planning. In particular approaches such as Lean Startup and Effectuation as well as concepts for the financing of young enterprises are treated.

A "KIT Entrepreneurship Talk" is part of each session, in which experienced founder and entrepreneur personalities report on their experiences in practice of the establishment of an enterprise. Dates and speakers will be announced on the EnTechnon homepage.

**Learning objectives:**

The students are introduced to the topic Entrepreneurship. After successful attendance of the meeting they are to have an overview of the subranges of the Entrepreneurships and be able to understand basic concepts of the Entrepreneurships and apply key concepts.

**Workload:**

Total effort with 3 credit points: approx. 90 hours

Presence time: 30 hours

Pre- and postprocessing of the LV: 45.0 hours

Exam and exam preparation: 15.0 hours

**Examination:**

The assessment of success takes place in the form of a written examination (60 min.) (according to §4(2), 1 SPO). The grade is the grade of the written exam.

A grade bonus can be earned through successful participation in a case study in the Entrepreneurship lecture. If the grade of the written exam is between 4.0 and 1.3, the bonus improves the grade by up to 0.3 or 0.4. The bonus only applies if you have passed the exam with at least a 4.0. More details will be provided in the lecture. Participation in the case study is voluntary.

**Exam date:** tba

**Organizational issues**

VL findet jeweils Mo, 15:45 - 19:00 an folgenden Terminen statt:

21.10.2024

28.10.2024

04.11.2024

11.11.2024

18.11.2024

25.11.2024

02.12.2024

09.12.2024 (Prep Session 13:30 - 14:30)

**Literature**

Aulet, Bill (2013): Disciplined Entrepreneurship. 24 Steps to a Successful Startup. Hoboken: Wiley.

R.C. Dorf, T.H. Byers: Technology Ventures – From Idea to Enterprise., (McGraw Hill 2008)

Füglister, Urs, Müller, Christoph and Volery, Thierry (2008): Entrepreneurship

Hisrich, Robert D.; Ramadani, Veland (2017): Effective entrepreneurial management. Strategy, planning, risk management, and organization. Cham, Switzerland: Springer.

Ries, Eric (2011): The Lean Startup.

Osterwalder, Alexander (2010): Business Model Generation.

**Entrepreneurship**

2545001, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**

**Content**

The lecture as a compulsory part of the module "Entrepreneurship" introduces the basic concepts of entrepreneurship. Important concepts and empirical facts are introduced, which relate to the conception and implementation of newly founded companies.

The focus here is on introducing methods for generating innovative business ideas, translating patents into business concepts, and general principles of business modeling and business planning. In particular, approaches such as Lean-Startup and Effectuation as well as concepts for financing young companies are covered.

A "KIT Entrepreneurship Talk" is part of each session, in which experienced founder and entrepreneur personalities report on their experiences in the practice of the establishment of an enterprise. Dates and speakers will be announced on the EnTechnon homepage.

**Learning objectives:**

The students will be introduced to the topic of entrepreneurship. After successful attendance of the course they should have an overview of the sub-areas of entrepreneurship and be able to understand basic concepts of entrepreneurship and apply key concepts.

**Workload:**

The total effort with 3 credit points: approx. 90 hours

Presence time: 30 hours

Pre- and postprocessing of the LV: 45.0 hours

Exam and exam preparation: 15.0 hours

**Examination:**

The assessment consists of a written exam (60 minutes) (following §4(2), 1 of the examination regulation)

A grade bonus can be earned by successfully participating in a case study as part of the Entrepreneurship lecture. If the grade of the written exam is between 4.0 and 1.3, the bonus improves the grade by up to 0.3 or 0.4. The bonus only applies if you have passed the exam with at least a 4.0. More details will be provided in the lecture. Participation in the case study is voluntary.

Exam dates: tbd

**Organizational issues**

VL findet jeweils Di, 15:45 - 19:00 an folgenden Terminen statt:

22.04.2025

29.04.2025

06.05.2025

13.05.2025

20.05.2025

27.05.2025

03.06.2025 (inkl. Prep Session)

17.06.2025 (Klausur)

**Literature**

Füglister, Urs, Müller, Christoph und Volery, Thierry (2008): Entrepreneurship

Ries, Eric (2011): The Lean Startup

Osterwalder, Alexander (2010): Business Model Generation

Aulet, Bill (2013): Disciplined Entrepreneurship. 24 Steps to a Successful Startup. Hoboken: Wiley.

R.C. Dorf, T.H. Byers: Technology Ventures – From Idea to Enterprise., (McGraw Hill 2008)

Hisrich, Robert D.; Ramadani, Veland (2017): Effective entrepreneurial management. Strategy, planning, risk management, and organization. Cham, Switzerland: Springer.

**T****3.99 Course: Exercises - Fatigue of Welded Components and Structures [T-MACH-109304]****Responsible:** Dr. Majid Farajian**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each winter term	1

**Competence Certificate**

successful solving of all exercises

**Prerequisites**

none

**Workload**

30 hours



### 3.100 Course: Exercises - Tribology [T-MACH-109303]

**Responsible:** Prof. Dr. Martin Dienwiebel

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	0	pass/fail	Each winter term	1 terms	1

Events					
WT 24/25	2181114	<a href="#">Tribology</a>	5 SWS	Lecture / Practice ( / ) ●	Dienwiebel, Scherge
Exams					
WT 24/25	76-T-MACH-109303	<a href="#">Exercises - Tribology</a>	Dienwiebel		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

successful solving of all exercises

#### Prerequisites

none

#### Workload

20 hours

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



#### Tribology

2181114, WS 24/25, 5 SWS, Language: German, [Open in study portal](#)

Lecture / Practice (VÜ)  
On-Site

## Content

- Chapter 1: Friction  
adhesion, geometrical and real area of contact, Friction experiments, friction powder, tribological stressing, environmental 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.

The student can

- describe the fundamental friction and wear mechanisms, which occur in tribologically stressed systems
- evaluate the friction and wear behavior of tribological systems
- explain the effects of lubricants and their most important additives
- identify suitable approaches to optimize tribological systems
- explain the most important experimental methods for the measurement of friction and wear, and is able to use them for the characterisation of tribo pairs
- choose suitable methods for the evaluation of roughness and topography from the nm-scale to the mm-scale and is able to interpret the determined values in respect to their effect on the tribological behavior
- describe the most important surface-analytical methods and their physical principles for the characterization of tribologically stressed sliding surfaces

preliminary knowledge in mathematics, mechanics and materials science recommended

regular attendance: 45 hours

self-study: 195 hours

oral examination (ca. 40 min)

no tools or reference materials

admission to the exam only with successful completion of the exercises

## 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

**3.101 Course: Exercises for Applied Materials Simulation [T-MACH-107671]**





**Responsible:** Prof. Dr. Peter Gumbsch  
Dr.-Ing. Johannes Schneider

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each summer term	3

Events					
ST 2025	2182614	<a href="#">Applied Materials Simulation</a>	4 SWS	Lecture / Practice ( /  )	Gumbsch

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

successful solving of all exercises

**Prerequisites**

T-MACH-110928 – Exercises for Applied Materials Simulation has not been started

**Workload**

60 hours

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

## V

**Applied Materials Simulation**

2182614, SS 2025, 4 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)  
Online**

**Content**

This lecture should give the students an overview of different simulation methods in the field of materials science and engineering. Numerical methods are presented and their use in different fields of application and size scales shown and discussed. On the basis of theoretical as well as practical aspects, a critical examination of the opportunities and challenges of numerical material simulation shall be carried out.

The student can

- define different numerical methods and distinguish their range of application
- approach issues by applying the finite element method and discuss the processes and results
- understand complex processes of metal forming and crash simulation and discuss the structural and material behavior
- define and apply the physical fundamentals of particle-based simulation techniques to applications of materials science
- illustrate the range of application of atomistic simulation methods and distinguish between different models

preliminary knowledge in mathematics, physics and materials science recommended

regular attendance: 34 hours

exercise: 11 hours

self-study: 165 hours

oral exam ca. 35 minutes

no tools or reference materials

admission to the exam only with successful completion of the exercises

**Organizational issues**

Die Vorlesung wird nur als Aufzeichnung angeboten!

Bitte besuchen Sie die englischsprachige Veranstaltung "Applied Materials Simulation" (2182616)!

Weitere Informationen finden Sie in ILIAS.

Kontakt: [johannes.schneider@kit.edu](mailto:johannes.schneider@kit.edu)

**Literature**

1. D. Frenkel, B. Smit: Understanding Molecular Simulation: From Algorithms to Applications, Academic Press, 2001
2. W. Kurz, D.J. Fisher: Fundamentals of Solidification, Trans Tech Publications, 1998
3. P. Haupt: Continuum Mechanics and Theory of Materials, Springer, 1999
4. M. P. Allen, D. J. Tildesley: Computer simulation of liquids, Clarendon Press, 1996

## T

**3.102 Course: Exercises for Materials Characterization [T-MACH-107685]**

**Responsible:** Dr.-Ing. Jens Gibmeier  
Prof. Dr. Reinhard Schneider

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each summer term	4

Events					
ST 2025	2174586	<a href="#">Materials Characterization</a>	2 SWS	Lecture / 🗣️	Gibmeier, Peterlechner
ST 2025	2174988	<a href="#">Tutorials and lab courses for "materials characterization"</a>	1 SWS	Practice / 🗣️	Gibmeier, Peterlechner
Exams					
ST 2025	76-T-MACH-107685	<a href="#">Exercises for Materials Characterization</a>	Gibmeier		

Legend: 🗣️ Online, 🗣️🗣️ Blended (On-Site/Online), 🗣️ On-Site, ✕ Cancelled

**Competence Certificate**

Regular attendance

**Prerequisites**

T-MACH-110945 – Exercises for Materials Characterization has not been started

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-110945 - Exercises for Materials Characterization](#) must not have been started.

**Workload**

60 hours

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

## V

**Materials Characterization**

2174586, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

The following methods will be introduced within this lecture:

- microscopic methods: optical microscopy, electron microscopy (SEM/TEM), atomic force microscopy
- material and microstructure analyses by means of X-ray, neutron and electron beams
- analysis methods at SEM/TEM (e.g. EELS)
- spectroscopic methods (e.g. EDS / WDS)

**learning objectives:**

The students have fundamental knowledge about methods of material analysis. They have a basic understanding to transfer this fundamental knowledge on problems in engineering science. Furthermore, the students have the ability to describe technical material by its microscopic and submicroscopic structure.

**Literature**

Vorlesungsskript (wird zu Beginn der Veranstaltung ausgegeben).

Literatur wird zu Beginn der Veranstaltung bekanntgegeben.

## V

**Tutorials and lab courses for "materials characterization"**

2174988, SS 2025, 1 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)**  
**On-Site**

**Content**

s. lecture "materials characterization" (V-No. 2174586)



**Organizational issues**

Die Termine und der Ort zu den Übungen und Laborbesuche zur Vorlesung Werkstoffanalytik (V-Nr. 2174586) werden in der Vorlesung bekanntgegeben.

The dates and locations of the tutorials and lab courses for the lecture materials characterization (V-No. 2174586) will be announced in one of the first lectures.

**Literature**

Vorlesungsskript (wird zu Beginn der Veranstaltung ausgegeben).

Literatur wird zu Beginn der Veranstaltung bekanntgegeben.

## T


**3.103 Course: Exercises for Materials Characterization [T-MACH-110945]**





**Responsible:** Dr.-Ing. Jens Gibmeier  
Prof. Dr. Reinhard Schneider

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each winter term	1

Events					
WT 24/25	2173432	<a href="#">Tutorials and Lab Courses for "Materials Characterization"</a>	1 SWS	Practice / 	Gibmeier, Peterlechner
Exams					
WT 24/25	76-T-MACH-110945	<a href="#">Exercises for Materials Characterization</a>			Gibmeier

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Regular attendance

**Prerequisites**

T-MACH-107685 – Übungen zu Werkstoffanalytik has not been started

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-107685 - Exercises for Materials Characterization](#) must not have been started.

**Workload**

60 hours

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

## V

**Tutorials and Lab Courses for "Materials Characterization"**

2173432, WS 24/25, 1 SWS, Language: English, [Open in study portal](#)

**Practice (Ü)  
On-Site**

**Content**

s. lecture "materials characterization" (V-No. 2174586)

**Literature**

Vorlesungsskript (wird zu Beginn der Veranstaltung ausgegeben).

Literatur wird zu Beginn der Veranstaltung bekanntgegeben.


**T****3.104 Course: Exercises for Microstructure-Property-Relationships [T-MACH-110930]**





**Responsible:** Dr. Patric Gruber  
Prof. Dr. Christoph Kirchlechner

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each winter term	1

Events					
WT 24/25	2177021	<a href="#">Exercises in Microstructure-Property-Relationships</a>	1 SWS	Practice / 	Kirchlechner, Wagner, Gruber
Exams					
WT 24/25	76-T-MACH-110930	<a href="#">Exercises for Microstructure-Property-Relationships</a>			Kirchlechner, Gruber, Wagner

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Successful participation in a final colloquium

**Prerequisites**

T-MACH-107683 – Übungen zu Gefüge-Eigenschafts-Beziehungen has not been started

**Workload**

60 hours

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

**V****Exercises in Microstructure-Property-Relationships**

2177021, WS 24/25, 1 SWS, Language: English, [Open in study portal](#)

**Practice (Ü)  
On-Site**

**Content**

Exercise course for the lecture Microstructure-Property-Relationships LV Nr. 2177020.

## T


**3.105 Course: Exercises for Solid State Reactions and Kinetics of Phase Transformations [T-MACH-107632]**





**Responsible:** Dr. Peter Franke  
Prof. Dr. Hans Jürgen Seifert

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each winter term	4

Events					
WT 24/25	2193004	<a href="#">Exercises for Solid State Reactions and Kinetics of Phase Transformations</a>	1 SWS	Practice / 	Franke, Ziebert
Exams					
WT 24/25	76-T-MACH-107632	<a href="#">Exercises for Solid State Reactions and Kinetics of Phase Transformations</a>			Seifert, Franke

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

successful processing of exercises

**Prerequisites**

T-MACH-110926 – Exercises for Solid State Reactions and Kinetics of Phase Transformations has not been started

**Workload**

60 hours

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

## V

**Exercises for Solid State Reactions and Kinetics of Phase Transformations**

2193004, WS 24/25, 1 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)  
On-Site**

**Content**

1. Fick's laws of diffusion
2. Calculation of diffusion coefficients
3. Diffusion and solidification

Recommendations: Lecture in Solid State Reactions and Kinetics of Phase Transformations; Basic course in materials science and engineering; physical chemistry

Reinforcement of the lecture by the solution of practical and lecture-relevant exercises

regular attendance: 14 hours

self-study: 46 hours

**Literature**

Vorlesungsskript;

Lecture notes



### 3.106 Course: Experimental Dynamics [T-MACH-105514]

**Responsible:** Prof. Dr.-Ing. Alexander Fidlin

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	5	Grade to a third	Each summer term	2

#### 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.

#### Workload

120 hours

## T

**3.107 Course: Experimental Fluid Mechanics [T-MACH-105512]****Responsible:** Dr. Jochen Kriegseis**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
WT 24/25	2153530	<a href="#">Experimental Fluid Mechanics</a>	2 SWS	Lecture / 	Kriegseis
ST 2025	2153530	<a href="#">Experimental Fluid Mechanics</a>	2 SWS	Lecture / 	Kriegseis
Exams					
WT 24/25	76-T-MACH-105512	<a href="#">Experimental Fluid Mechanics</a>			Kriegseis
ST 2025	76-T-MACH-105512	<a href="#">Experimental Fluid Mechanics</a>			Kriegseis

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam - 30 minutes

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Experimental Fluid Mechanics**2153530, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**Blended (On-Site/Online)****Content**

The students can describe the relevant physical principles of experimental fluid mechanics. They are qualified to comparatively discuss the introduced measurement techniques. Furthermore, they are able to distinguish (dis-)advantages of the respective approaches. The students can evaluate and discuss measurement signal and data obtained with the common fluid mechanical measuring techniques.

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 measurable quantities
- measurements in turbulent flows
- pressure measurements
- hot wire measurements
- optical measuring techniques
- error analysis
- scaling laws
- signal and data evaluation

**Literature**

Tropea, C., Yarin, A.L., Foss, J.F.: Springer Handbook of Experimental Fluid Mechanics, Springer 2007

Nitsche, W., Brunn, A.: Strömungsmesstechnik, Springer, 2006

Spurk, J.H.: Strömungslehre, Springer, 1996

Tropea, C., Yarin, A.L., Foss, J.F.: Springer Handbook of Experimental Fluid Mechanics, Springer 2007

Spurk, J.H.: Fluid Mechanics, Springer, 1997

**Experimental Fluid Mechanics**2153530, SS 2025, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**Blended (On-Site/Online)****Content**

The students can describe the relevant physical principles of experimental fluid mechanics. They are qualified to comparatively discuss the introduced measurement techniques. Furthermore, they are able to distinguish (dis-)advantages of the respective approaches. The students can evaluate and discuss measurement signal and data obtained with the common fluid mechanical measuring techniques.

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

**Literature**

Tropea, C., Yarin, A.L., Foss, J.F.: Springer Handbook of Experimental Fluid Mechanics, Springer 2007

Nitsche, W., Brunn, A.: Strömungsmesstechnik, Springer, 2006

Spurk, J.H.: Strömungslehre, Springer, 1996


Tropea, C., Yarin, A.L., Foss, J.F.: Springer Handbook of Experimental Fluid Mechanics, Springer 2007





Spurk, J.H.: Fluid Mechanics, Springer, 1997

## T

**3.108 Course: Experimental Lab Class in Welding Technology, in Groups [T-MACH-102099]****Responsible:** Dr.-Ing. Stefan Dietrich**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each winter term	3

Events					
WT 24/25	2173560	<a href="#">Welding Lab Course, in groupes</a>	3 SWS	Practical course / 	Dietrich, Schulze
Exams					
WT 24/25	76-T-MACH-102099	<a href="#">Experimental Lab Class in Welding Technology, in Groups</a>	Dietrich		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Lab Course Report

**Annotation**

The lab takes place at the beginning of the winter semester break once a year. The registration is possible during the lecture period via [iam-wk-lehre@iam.kit.edu](mailto:iam-wk-lehre@iam.kit.edu) at the IAM – WK. The lab is carried out in the Handwerkskammer Karlsruhe.

You need sturdy shoes and long clothes!

**Workload**

120 hours

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

## V

**Welding Lab Course, in groupes**2173560, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)**Practical course (P)  
On-Site****Content**

The lab takes place at the beginning of the winter semester break once a year. The registration is possible during the lecture period in the secretariat of the Institute of Applied Materials (IAM – WK). The lab is carried out in the Handwerkskammer Karlsruhe.

**learning objectives:** The students are capable to name a survey of current welding processes and their suitability for joining different metals. The students can evaluate the advantages and disadvantages of the individual procedures. The students have weld with different welding processes.

**requirements:**

You need sturdy shoes and long clothes!

**workload:**

regular attendance: 31,5 hours

preparation: 8,5 hours

lab report: 80 hours



**Organizational issues**

Die Anmeldung erfolgt durch den Beitritt in den ILIAS-Kurs.

Die Lehrveranstaltung "Experimentelles schweißtechnisches Praktikum" findet dieses Jahr wieder in der Woche vom 03.-07. März 2025 statt. Der Veranstaltungsort ist die

Bildungsakademie Handwerkskammer Karlsruhe  
Hertzstr. 177  
76187 Karlsruhe

Die Gruppeneinteilung in die beiden Gruppen findet Anfang Februar statt!

- Gruppe 1. Montag 7.30 Uhr bis Mittwoch 12.00 Uhr
- Gruppe 2. Mittwoch 13.00 Uhr bis Freitag 15.00 Uhr

Sollte aufgrund anderer LV oder Prüfungen für Sie nur eine der beiden Gruppen in Frage kommen, melden Sie sich bitte rechtzeitig unter [iam-wk-lehre@iam.kit.edu](mailto:iam-wk-lehre@iam.kit.edu)

Bitte bringen Sie festes und geschlossenes Schuhwerk (optimalerweise Arbeitsschuhe) und lange und entbehrliche Hosen sowie Oberteile mit, da wir uns die Hände schmutzig machen und mit flüssigem, umherfliegendem Metall konfrontiert sein werden. Für die Mittagspause können Sie sich selbst versorgen oder auch in der Mensa der Bildungsakademie essen.



**Literature**





wird im Praktikum ausgegeben

## T

**3.109 Course: Fabrication Processes in Microsystem Technology [T-MACH-102166]****Responsible:** Dr. Klaus Bade**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each term	1

Events					
WT 24/25	2143882	<a href="#">Fabrication Processes in Microsystem Technology</a>	2 SWS	Lecture / 	Bade
ST 2025	2143882	<a href="#">Fabrication Processes in Microsystem Technology</a>	2 SWS	Lecture / 	Bade
Exams					
WT 24/25	76-T-MACH-102166	<a href="#">Fabrication Processes in Microsystem Technology</a>	Bade		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral examination, 20 minutes

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Fabrication Processes in Microsystem Technology**2143882, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
Blended (On-Site/Online)****Literature**

M. Madou

Fundamentals of Microfabrication

CRC Press, Boca Raton, 1997

W. Menz, J. Mohr, O. Paul

Mikrosystemtechnik für Ingenieure

Dritte Auflage, Wiley-VCH, Weinheim 2005

L.F. Thompson, C.G. Willson, A.J. Bowden

Introduction to Microlithography

2nd Edition, ACS, Washington DC, 1994

## V

**Fabrication Processes in Microsystem Technology**2143882, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
On-Site****Content**

The lecture offers an advanced understanding of manufacturing processes in microsystem technology. Basic aspects of microtechnological processing will be introduced. With examples from semiconductor microfabrication and microsystem technology the base processing steps for conditioning and finishing, patterning, removal are imparted. Nano-patterning is covered is also included and the micro-nano interface is discussed. By the help of typical processing steps elementary mechanisms, process execution, and equipment are explained. Additionally quality control, process control and environmental topics are included

**Literature**

M. Madou

Fundamentals of Microfabrication

CRC Press, Boca Raton, 1997

W. Menz, J. Mohr, O. Paul

Mikrosystemtechnik für Ingenieure

Dritte Auflage, Wiley-VCH, Weinheim 2005

L.F. Thompson, C.G. Willson, A.J. Bowden

Introduction to Microlithography

2nd Edition, ACS, Washington DC, 1994

**3.110 Course: Failure Analysis [T-MACH-105724]**

**Responsible:** Prof. Dr. Christian Greiner  
Dr.-Ing. Johannes Schneider

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	2182572	<a href="#">Failure Analysis</a>	2 SWS	Lecture /	Greiner, Schneider
Exams					
WT 24/25	76-T-MACH-105724	<a href="#">Failure Analysis</a>			Schneider, Greiner
ST 2025	76-T-MACH-105724	<a href="#">Failure Analysis</a>			Schneider

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral examination, ca. 30 min

**Prerequisites**

none

**Recommendation**

basic knowledge in materials science (e.g. lecture materials science I and II)

**Workload**

120 hours

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

**Failure Analysis**

2182572, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**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

The students are able to discuss damage evaluation and to perform damage investigations. They know the common necessary investigation

methods and can regard failures considering load and material resistance. Furthermore they can describe and discuss the most important types of failure and damage appearance.

basic knowledge in materials science (e.g. lecture materials science I and II) recommended

regular attendance: 21 hours

self-study: 99 hours

oral exam, duration: ca. 30 minutes

no notes

**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****3.111 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2181711	<a href="#">Failure of structural materials: deformation and fracture</a>	3 SWS	Lecture / Practice ( / )	Gumbsch, Weygand
Exams					
WT 24/25	76-T-MACH-102140	<a href="#">Failure of Structural Materials: Deformation and Fracture</a>			Weygand, Gumbsch, Kraft

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam ca. 30 minutes

no tools or reference materials

**Prerequisites**

none

**Recommendation**

preliminary knowledge in mathematics, mechanics and materials science

**Workload**

120 hours

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

**V****Failure of structural materials: deformation and fracture**

2181711, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)**  
**On-Site**

**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 elastic fracture mechanics
  - crack resistance
  - experimental measurement of fracture toughness
  - defect measurement
  - crack propagation
  - application of fracture mechanics
  - atomistics of fracture

**The student**

- has the basic understanding of mechanical processes to explain the relationship between externally applied load and materials strength.
- can explain the foundation of linear elastic fracture mechanics and is able to determine if this concept can be applied to a failure by fracture.
- can describe the main empirical materials models for deformation and fracture and can apply them.
- has the physical understanding to describe and explain phenomena of failure.

preliminary knowledge in mathematics, mechanics and materials science recommended

regular attendance: 22,5 hours

self-study: 97,5 hours

The assessment consists of an oral examination (ca. 30 min) according to Section 4(2), 2 of the examination regulation.

**Organizational issues**

Übungstermine werden in der Vorlesung bekannt gegeben!

Die Veranstaltung wird letztmals im Wintersemester 2025/2026 angeboten!

**Literature**

- Engineering Materials, M. Ashby and D.R. Jones (2nd Edition, Butterworth-Heinemann, Oxford, 1998); sehr lesenswert, relativ einfach aber dennoch umfassend, verständlich
- Mechanical Behavior of Materials, Thomas H. Courtney (2nd Edition, McGraw Hill, Singapur); Klassiker zu den mechanischen Eigenschaften der Werkstoffe, umfangreich, gut
- Bruchvorgänge in metallischen Werkstoffen, D. Aurich (Werkstofftechnische Verlagsgesellschaft Karlsruhe), relativ einfach aber dennoch umfassender Überblick für metallische Werkstoffe

## T

**3.112 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Oral examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2181715	<a href="#">Failure of Structural Materials: Fatigue and Creep</a>	2 SWS	Lecture / 	Gruber, Gumbsch
Exams					
WT 24/25	76-T-MACH-102139	<a href="#">Failure of Structural Materials: Fatigue and Creep</a>	Gruber, Gumbsch		
ST 2025	76-T-MACH-102139	<a href="#">Failure of Structural Materials: Fatigue and Creep</a>	Gruber, Gumbsch		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam ca. 30 minutes

no tools or reference materials

**Prerequisites**

none

**Recommendation**

preliminary knowledge in mathematics, mechanics and materials science

**Workload**

120 hours

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

## V

**Failure of Structural Materials: Fatigue and Creep**

2181715, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**



**Content****1 Fatigue**

## 1.1 Introduction

## 1.2 Lifetime

## 1.3 Fatigue Mechanisms

## 1.4 Material Selection

## 1.5 Notches and Shape Optimization

## 1.6 Case Studies: ICE-Accidents

**2 Creep**

## 2.1 Introduction

## 2.2 High Temperature Plasticity

## 2.3 Phänomenological Description of Creep

## 2.4 Creep Mechanisms

## 2.5 Alloying Effects

**The student**

- has the basic understanding of mechanical processes to explain the relationships between externally applied load and materials strength.
- can describe the main empirical materials models for fatigue and creep and can apply them.
- has the physical understanding to describe and explain phenomena of failure.
- can use statistical approaches for reliability predictions.
- can use its acquired skills, to select and develop materials for specific applications.

preliminary knowledge in mathematics, mechanics and materials science recommended

regular attendance: 22,5 hours

self-study: 97,5 hours

The assessment consists of an oral examination (ca. 30 min) according to Section 4(2), 2 of the examination regulation.

**Organizational issues**

Die Veranstaltung wird letztmals im Wintersemester 2025/2026 angeboten!


**Literature**

- Engineering Materials, M. Ashby and D.R. Jones (2nd Edition, Butterworth-Heinemann, Oxford, 1998); sehr lesenswert, relativ einfach aber dennoch umfassend, verständlich
- Mechanical Behavior of Materials, Thomas H. Courtney (2nd Edition, McGraw Hill, Singapur); Klassiker zu den mechanischen Eigenschaften der Werkstoffe, umfangreich, gut
- Bruchvorgänge in metallischen Werkstoffen, D. Aurich (Werkstofftechnische Verlagsgesellschaft Karlsruhe), relativ einfach aber dennoch umfassender Überblick für metallische Werkstoffe
- Fatigue of Materials, Subra Suresh (2nd Edition, Cambridge University Press); Standardwerk über Ermüdung, alle Materialklassen, umfangreich, für Einsteiger und Fortgeschrittene

## T

**3.113 Course: Fatigue of Materials [T-MACH-112106]****Responsible:** Dr.-Ing. Stefan Guth**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	2

Events					
ST 2025	2173586	<a href="#">Fatigue of Materials</a>	2 SWS	Lecture / 	Guth
Exams					
WT 24/25	76-T-MACH-112106	<a href="#">Fatigue of Materials</a>			Guth
ST 2025	76-T-MACH-112106	<a href="#">Fatigue of Materials</a>			Guth

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral exam, about 20 minutes

**Prerequisites**

none

**Recommendation**

Basic knowledge in Materials Science will be helpful.

**Workload**

120 hours

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

## V

**Fatigue of Materials**2173586, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

- Introduction: historical review and some fatigue damage cases
- Cyclic Stress Strain Behaviour
- Crack Initiation
- Crack Propagation
- Lifetime Behaviour under Cyclic Loading
- Fatigue of Notched Components
- Structural Durability
- Fatigue of composites and compound materials

**learning objectives:**

The students are able to recognise the deformation and the failure behaviour of materials under cyclic loading and to assign it to the basic microstructural processes. They know the sequence and the development of fatigue damages and can evaluate the initiation and the growth of fatigue cracks.

The students can evaluate the cyclic strength behaviour of materials and components both qualitatively and quantitatively and know the procedures for the assessment of single-stage, multistage and stochastic cyclical loadings.

**requirements:**

none, basic knowledge in Material Science will be helpful

**workload:**

regular attendance: 21 hours

self-study: 99 hours

**Literature**

Ein Manuskript, das auch aktuelle Literaturhinweise enthält, wird in der Vorlesung verteilt.

## T

**3.114 Course: Fatigue of Welded Components and Structures [T-MACH-105984]****Responsible:** Dr. Majid Farajian**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	3	Grade to a third	Each winter term	1

**Competence Certificate**

oral examination (ca. 30 min)

no tools or reference materials

**Prerequisites**

admission to the exam only with successful completion of the exercises [T-MACH-109304]

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-109304 - Exercises - Fatigue of Welded Components and Structures](#) must have been passed.

**Recommendation**

preliminary knowledge materials science and mechanics

**Workload**

90 hours

**3.115 Course: FEM Workshop - Constitutive Laws [T-MACH-105392]**

**Responsible:** PD Dr.-Ing. Katrin Schulz  
Dr. Daniel Weygand

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each term	1

Events					
WT 24/25	2183716	<a href="#">FEM Workshop -- constitutive laws</a>	2 SWS	Block /	Schulz, Weygand
ST 2025	2183716	<a href="#">FEM Workshop -- Constitutive Laws</a>	2 SWS	Block /	Schulz, Weygand

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

solving of a FEM problem

preparation of a report

preparation of a short presentation

**Prerequisites**

none

**Recommendation**

Engineering Mechanics; Advanced Mathematics; Introduction to Theory of Materials

**Workload**

120 hours

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

**FEM Workshop -- constitutive laws**

2183716, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Block (B)  
On-Site**

**Content**

The course repeats the fundamentals of the theory of materials. It leads to the characterization and classification of material behavior as well as the specification by adequate material models. Here we focus on elastic, viscoelastic, plastic, and viscoplastic deformation behavior. Introducing the finite element program ABAQUS, the students learn how to analyze the material models numerically. Therefore ABAQUS-own and continuative constitutive equations are chosen.

The student

- has the basic understanding of the materials theory and the classification of materials
- is able to independently generate numerical models using ABAQUS and can choose and apply adequate constitutive equations

Engineering Mechanics; Advanced Mathematics; Introduction to Theory of Materials recommended

regular attendance: 28 hours

self-study: 92 hours

Oral examination (ca. 20 min) in the elective module MSc, otherwise no grading

solving of a FEM problem

preparation of a report

preparation of a short presentation

**Organizational issues**

Blockveranstaltung: Anmeldung bei der Dozentin (katrin.schulz@kit.edu) bis zum 10.10.2024, Termine siehe Aushang!

**Literature**

Peter Haupt: Continuum Mechanics and Theory of Materials, Springer; ABAQUS Manual; Skript

KIT Department of Mechanical Engineering - Non-degree Studies (Domestic Degree at Another Higher Education Institution)

Module Handbook as of 21/02/2025

**FEM Workshop -- Constitutive Laws**2183716, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Block (B)**  
**Blended (On-Site/Online)****Content**

The course repeats the fundamentals of the theory of materials. It leads to the characterization and classification of material behavior as well as the specification by adequate material models. Here we focus on elastic, viscoelastic, plastic, and viscoplastic deformation behavior. Introducing the finite element program ABAQUS, the students learn how to analyze the material models numerically. Therefore ABAQUS-own and continuative constitutive equations are chosen.

The student

- has the basic understanding of the materials theory and the classification of materials
- is able to independently generate numerical models using ABAQUS and can choose and apply adequate constitutive equations

Engineering Mechanics; Advanced Mathematics; Introduction to Theory of Materials recommended

regular attendance: 28 hours

self-study: 92 hours

Oral examination (ca. 20 min) in the elective module MSc, otherwise no grading

solving of a FEM problem

preparation of a report

preparation of a short presentation

**Organizational issues**

Blockveranstaltung, Termine werden noch bekannt gegeben!

Anmeldung per Email bis zum 25.04.2025 an [katrin.schulz@kit.edu](mailto:katrin.schulz@kit.edu)

## T

**3.116 Course: Financial Analysis [T-WIWI-102900]****Responsible:** Dr. Torsten Luedecke**Organisation:** KIT Department of Economics and Management**Part of:** [M-MACH-104884 - Courses of the KIT Department of Economics and Management](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4,5	Grade to a third	Each summer term	2

Events					
ST 2025	2530205	<a href="#">Financial Analysis</a>	2 SWS	Lecture / 🗎	Luedecke
ST 2025	2530206	<a href="#">Übungen zu Financial Analysis</a>	2 SWS	Practice / 🗎	Luedecke
Exams					
WT 24/25	7900059	<a href="#">Financial Analysis</a>			Ruckes, Luedecke
ST 2025	7900075	<a href="#">Financial Analysis</a>			Luedecke

Legend: 🗎 Online, 🗎 Blended (On-Site/Online), 🗎 On-Site, ✕ Cancelled

**Competence Certificate**

See German version.

**Prerequisites**

None

**Recommendation**

Basic knowledge in corporate finance, accounting, and valuation is required.

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

## V

**Financial Analysis**2530205, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
On-Site****Literature**

- Alexander, D. and C. Nobes (2017): Financial Accounting – An International Introduction, 6th ed., Pearson.
- Penman, S.H. (2013): Financial Statement Analysis and Security Valuation, 5th ed., McGraw Hill.

**T****3.117 Course: Finite Element Workshop [T-MACH-105417]**





**Responsible:** Prof. Dr. Claus Mattheck  
Dr. Daniel Weygand

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each summer term	1

Events					
ST 2025	2182731	<a href="#">Finite Element Workshop</a>	2 SWS	Block / 	Tesari, Weygand, Mattheck
Exams					
ST 2025	76-T-MACH-105417	<a href="#">Finite Element Workshop</a>			Mattheck, Gruber, Weygand

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

attendance certificate for participation in all course dates

**Prerequisites**

none

**Recommendation**

Continuum Mechanics

**Workload**

120 hours

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

**V****Finite Element Workshop**

2182731, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Block (B)**  
**On-Site**

**Content**

The students will learn the foundations of the FEM stress analysis and the optimization methode 'Zugdreiecke'.

The student can

- perform stress analysis for simple components using the commercial software package ANSYS
- utilise the method of the tensile triangle to optimize the shape of components with respect to stress distribution

Fundamentals of Continuum Mechanics are required.

regular attendance: 22,5 hours

certificate in case of regular attendance

**Organizational issues**



**Weitere Veranstaltung im Sommersemester 2024:**




**Der Finite-Elemente Workshop findet vom 02. bis 05. April 2024 am CN, Bau 421, Raum 413 statt.**

**Bei Interesse wenden Sie sich bitte an: [iwiza.tesari@kit.edu](mailto:iwiza.tesari@kit.edu)**

## T

**3.118 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2189910	<a href="#">Flows and Heat Transfer in Energy Technology</a>	2 SWS	Lecture / 	Cheng
WT 24/25	2189911	<a href="#">Tutorial 'Flows and Heat Transfer in Energy Technology'</a>	1 SWS	Practice / 	Cheng, Mitarbeiter
Exams					
WT 24/25	76-T-MACH-105403	<a href="#">Flows and Heat Transfer in Energy Technology</a>	Cheng		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, 20 min

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Flows and Heat Transfer in Energy Technology**2189910, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

This lecture is dedicated to students of mechanical engineering and other engineering Bachelor or Master degree courses. Goal of the lecture is the understanding of major processes in fluid dynamics and heat transfer in energy engineering. Through this lecture the students are capable of understanding the important physical processes and the selection of suitable methods for the analysis of the processes. With the discussion of some practical examples, the students can analyze the pressure drop and heat transfer in energy engineering systems.


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





**Literature**

- Bahr, H.D., Stephan, K., Wärme- und Stoffübertragung, 3. Auflage Springer Verlag, 1998



**T****3.119 Course: Flows with Chemical Reactions [T-MACH-105422]****Responsible:** apl. Prof. Dr. Andreas Class**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2153406	<a href="#">Flows with chemical reactions</a>	2 SWS	Lecture / 	Class
Exams					
WT 24/25	76-T-MACH-105422	<a href="#">Flows with Chemical Reactions</a>	Class		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, duration 30 minutes

Auxiliary none

**Prerequisites**

none

**Recommendation**

Fluid Mechanics (T-MACH-105207)

Mathematical Methods in Fluid Mechanics (T-MACH-105295)

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Flows with chemical reactions**2153406, WS 24/25, 2 SWS, Language: German/English, [Open in study portal](#)**Lecture (V)**  
**Blended (On-Site/Online)****Content**

The students can describe flow scenarios, where a chemical reaction is confined to a thin layer. They can choose simplifying approaches for the underlying chemistry and discuss the problems with focus on the fluid mechanic aspects. The students are able to solve simple problems analytically. Furthermore, they are qualified to discuss simplifications as relevant for an efficient numerical solution of complex problems.

In the lecture we mainly consider problems, where chemical reaction is confined to a thin layer.

The problems are solved analytically or they are at least simplified allowing for efficient numerical


solution procedures. We apply simplified chemistry and focus on the fluid mechanic aspects of the problems.





**Literature**

Vorlesungsskript

Buckmaster, J.D.; Ludford, G.S.S.: Lectures on Mathematical Combustion, SIAM 1983

**T****3.120 Course: Fluid Mechanics of Turbulent Flows [T-BGU-110841]****Responsible:** Prof. Dr.-Ing. Markus Uhlmann**Organisation:** KIT Department of Civil Engineering, Geo and Environmental Sciences**Part of:** [M-MACH-105405 - Courses of the KIT Department of Civil Engineering, Geo and Environmental Sciences](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
ST 2025	6221806	<a href="#">Fluid Mechanics of Turbulent Flows</a>	4 SWS	Lecture / Practice ( /  )	Uhlmann
Exams					
WT 24/25	8244110841	<a href="#">Fluid Mechanics of Turbulent Flows</a>			Uhlmann

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 45 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**Workload**

180 hours

**3.121 Course: Fluid Power Systems [T-MACH-102093]**

**Responsible:** Prof. Dr.-Ing. Marcus Geimer  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each winter term	2

Events					
WT 24/25	2114093	<a href="#">Fluid Technology</a>	2 SWS	Lecture /	Geimer
Exams					
WT 24/25	76-T-MACH-102093	<a href="#">Fluid Power Systems</a>			Geimer
ST 2025	76-T-MACH-102093	<a href="#">Fluid Power Systems</a>			Geimer

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

The assessment consists of a oral exam taking place in the recess period. The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

**Prerequisites**

none

**Annotation****Learning Objectives:**

The student is able to

- apply and evaluate the physical principles of fluid technology,
- name common components and explain how they work,
- demonstrate the advantages and disadvantages of different components,
- dimension components for a given purpose
- and to calculate simple systems.

**Contents:**

In the area of hydrostatics, the following topics are covered

- Pressurized fluids,
- pumps and motors,
- valves,
- accessories and hydraulic circuits.

In the field of pneumatics, the following topics are covered

- Compressors,
- drives,
- valves and control systems.

**Literature:**

Lecture notes for the fluid technology lecture, downloadable via the ILIAS learning platform.

**Workload**

120 hours

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

**Fluid Technology**

2114093, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
On-Site

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

**Literature**

Skriptum zur Vorlesung *Fluidtechnik*  
Institut für Fahrzeugsystemtechnik  
downloadbar



### 3.122 Course: Fluid-Structure-Interaction [T-MACH-105474]

**Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel  
Dr.-Ing. Mark-Patrick Mühlhausen

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2154453	<a href="#">Fluid-Structure-Interaction with Python</a>	2 SWS	/	Mühlhausen
Exams					
WT 24/25	76-T-MACH-111507	<a href="#">Fluid-Structure-Interaction with Python</a>			Mühlhausen

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

oral exam 30 minutes

#### Prerequisites

none

#### Workload

120 hours

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



### Fluid-Structure-Interaction with Python

2154453, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Blended (On-Site/Online)**

#### Content

„The lecture provides the basics for the description and modeling of flows, structures and their interaction. In the practical part, the covered methods and procedures are deepened with various exercises and examples with Python and Ansys Fluent.

- Brief introduction to Python and Ansys Fluent
- Basic equations of continuum mechanics
- Smoothing and remeshing algorithms for mesh deformation
- Finite volume and finite element method
- Methods of fluid-structure interaction
- coupling conditions
- Monolithic and partitioned coupling methods
- Coupling algorithms for partitioned methods
- Stability and convergence of coupled systems”

#### Organizational issues

Die Anmeldung bitte bis zum 23.07.25 an [sekretariat@istm.kit.edu](mailto:sekretariat@istm.kit.edu) schicken.

#### Literature

wird in der Vorlesung vorgestellt

**3.123 Course: Foundations of Nonlinear Continuum Mechanics [T-MACH-105324]****Responsible:** apl. Prof. Marc Kamlah**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

Events					
WT 24/25	2181720	<a href="#">Foundations of nonlinear continuum mechanics</a>	2 SWS	Lecture /	Kamlah
Exams					
WT 24/25	76-T-MACH-105324	<a href="#">Foundations of Nonlinear Continuum Mechanics</a>			Kamlah
ST 2025	76-T-MACH-105324	<a href="#">Foundations of Nonlinear Continuum Mechanics</a>			Kamlah

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam

*Below you will find excerpts from events related to this course:***Foundations of nonlinear continuum mechanics**2181720, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

The lecture is organized in three parts. In the first part, the mathematical foundations of tensor algebra and tensor analysis are introduced, usually in cartesian representation. In the second part of the lecture, the kinematics, i.e. the geometry of deformation is presented. Besides finite deformation, geometric linearization is discussed. The third part of the lecture deals with the physical balance laws of thermomechanics. It is shown, how a special classical theory of continuum mechanics can be derived by adding a corresponding constitutive model. For the illustration of the theory, elementary examples are discussed repeatedly.

The students understand the fundamental structure of a continuum theory consisting of kinematics, balance laws and constitutive model. In particular, they recognize non-linear continuum mechanics as a common structure including all continuum theories of thermomechanics, which are obtained by adding a corresponding constitutive model. The students understand in detail the kinematics of finite deformation and know the transition to the geometrically linear theory they are familiar with. The students know the spatial and material representation of the theory and the different related tensors. The students take the balance laws as physical postulates and understand their respective physical motivation.

Qualification: Engineering Mechanics - Advanced Mathematics

regular attendance: 22,5 hours

self-study: 97,5 hours

oral exam ca. 30 minutes

**Literature**

Vorlesungsskript

## T


**3.124 Course: Foundry Technology [T-MACH-105157]**





**Responsible:** Dr.-Ing. Daniel Günther  
Dr.-Ing. Steffen Klan

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	3

Events					
ST 2025	2174575	<a href="#">Foundry Technology</a>	2 SWS	Lecture / 	Klan, Günther

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

The assessment is carried out as a written exam of about 1 h.

**Prerequisites**

none

**Recommendation**

The lectures Materials Science I and Materials Science II should have been attended in advance.

**Workload**

120 hours

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

## V

**Foundry Technology**

2174575, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Literature**

Literaturhinweise werden in der Vorlesung gegeben

Reference to literature, documentation and partial lecture notes given in lecture

## T

## 3.125 Course: Fuels and Lubricants for Combustion Engines [T-MACH-105184]

**Responsible:** Hon.-Prof. Dr. Bernhard Ulrich Kehrwald  
Dr.-Ing. Heiko Kubach

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Oral examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2133108	<a href="#">Fuels and Lubricants for Combustion Engines</a>	2 SWS	Lecture / 	Kehrwald
Exams					
WT 24/25	76-T-MACH-105184	<a href="#">Fuels and Lubricants for Combustion Engines</a>	Kehrwald		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### 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 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

### Content

electric drives and fuel cell drives with the associated operating materials will also be presented


- Introduction, basics, primary energy and energy chains
- Illustrative chemistry of hydrocarbons
- Fossil fuels, exploration, processing, standards
- Operating materials not fossil, renewable, alternative
- Fuels, lubricants, coolants, AdBlue
- Laboratory analysis, testing, test benches and measurement technology
- Excursion to test fields for motorized drives from 0.5 to 3,500 kW





### Literature

Skript



**T****3.126 Course: Functional Ceramics [T-MACH-105179]****Responsible:** Dr. Miriam Botros**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2126784	<a href="#">Functional Ceramics</a>	2 SWS	Lecture / 	Botros
Exams					
WT 24/25	76T-MACH-105179	<a href="#">Functional Ceramics</a>	Botros, Hinterstein		
ST 2025	76-T-MACH-105179	<a href="#">Functional Ceramics</a>	Botros, Hinterstein		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

The assessment consists of an oral exam (20 min) taking place at the agreed date.

Auxiliary means: none

The re-examination is offered upon agreement.

**Prerequisites**

none

**3.127 Course: Fundamentals for Design of Motor-Vehicle Bodies I [T-MACH-102116]****Responsible:** Dipl.-Ing. Horst Dietmar Bardehle**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
2**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1**Events**

WT 24/25	2113814	<a href="#">Fundamentals for Design of Motor-Vehicles Bodies I</a>	1 SWS	Lecture /	Bardehle
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**Exams**

WT 24/25	76-T-MACH-102116	<a href="#">Fundamentals for Design of Motor-Vehicle Bodies I</a>			Bardehle
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Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Oral group examination

Duration: 30 minutes

Auxiliary means: none

**Prerequisites**

none

**Workload**

60 hours

*Below you will find excerpts from events related to this course:***Fundamentals for Design of Motor-Vehicles Bodies I**2113814, WS 24/25, 1 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****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

**Learning Objectives:**

The students have an overview of the fundamental possibilities for design and manufacture of motor-vehicle bodies. They know the complete process, from the first idea, through the concept to the dimensioned drawings (e.g. with FE-methods). They have knowledge about the fundamentals and their correlations, to be able to analyze and to judge relating components as well as to develop them accordingly.

**Organizational issues**

Das Vorlesungsmaterial wird auf ILIAS bereitgestellt. Das ILIAS-Passwort erhalten Sie unter <https://fast-web-01.fast.kit.edu/Passwoerterllias/>

Termine und nähere Informationen: siehe ILIAS oder Institutshomepage

Dates and further information will be published on the homepage of the institute

**Literature**

1. Automobiltechnische Zeitschrift ATZ, Friedr. Vieweg & Sohn Verlagsges. mbH, Wiesbaden
2. Automobil Revue, Bern (Schweiz)
3. Automobil Produktion, Verlag Moderne Industrie, Landsberg

**3.128 Course: Fundamentals for Design of Motor-Vehicle Bodies II [T-MACH-102119]**

**Responsible:** Dipl.-Ing. Horst Dietmar Bardehle  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	2	Grade to a third	Each summer term	1

Events					
ST 2025	2114840	<a href="#">Fundamentals for Design of Motor-Vehicles Bodies II</a>	1 SWS	Lecture /	Knoch
Exams					
WT 24/25	76-T-MACH-102119	<a href="#">Fundamentals for Design of Motor-Vehicle Bodies II</a>			Bardehle

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Oral group examination

Duration: 30 minutes

Auxiliary means: none

**Prerequisites**

none

**Workload**

60 hours

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

**Fundamentals for Design of Motor-Vehicles Bodies II**

2114840, SS 2025, 1 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
On-Site

**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

**Learning Objectives:**

The students know that, often the design of seemingly simple detail components can result in the solution of complex problems. They have knowledge in testing procedures of body properties. They have an overview of body parts such as bumpers, window lift mechanism and seats. They understand, as well as, parallel to the normal electrical system, about the electronic side of a motor vehicle. Based on this they are ready to analyze and to judge the relation of these single components. They are also able to contribute competently to complex development tasks by imparted knowledge in project management.

**Organizational issues**

Voraussichtliche Termine, nähere Informationen und evtl. Änderungen:

siehe Institutshomepage.

Scheduled dates, further Information and possible changes of date:



see homepage of the institute.





**Literature**

1. Automobiltechnische Zeitschrift ATZ, Friedr. Vieweg & Sohn Verlagsges. mbH, Wiesbaden
2. Automobil Revue, Bern (Schweiz)
3. Automobil Produktion, Verlag Moderne Industrie, Landsberg

**T****3.129 Course: Fundamentals in the Development of Commercial Vehicles [T-MACH-111389]****Responsible:** Christof Weber**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	4	Grade to a third	see Annotations	2 terms	2

Events					
WT 24/25	2113812	<a href="#">Fundamentals in the Development of Commercial Vehicles I</a>	1 SWS	Lecture / 	Weber
ST 2025	2114844	<a href="#">Fundamentals in the Development of Commercial Vehicles II</a>	1 SWS	Lecture / 	Weber
Exams					
WT 24/25	76T-MACH-111389	<a href="#">Fundamentals in the Development of Commercial Vehicles</a>	Weber		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral group examination

Duration: appr. 30 minutes

Auxiliary means: none

**Prerequisites**

none

**Annotation**

Fundamentals in the Development of Commercial Vehicles I, WT

Fundamentals in the Development of Commercial Vehicles II, ST

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Fundamentals in the Development of Commercial Vehicles I**2113812, WS 24/25, 1 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
On-Site**

**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

**Learning Objectives:**

The students have proper knowledge about the process of commercial vehicle development starting from the concept and the underlying original idea to the real design. They know that the customer requirements, the technical realisability, the functionality and the economy are important drivers.

The students are able to develop parts and components. Furthermore they have knowledge about different cab concepts, the interior and the interior design process. Consequently they are ready to analyze and to judge concepts of commercial vehicles as well as to participate competently in the commercial vehicle development.

**Organizational issues**

Das Vorlesungsmaterial wird auf ILIAS bereitgestellt. Das ILIAS-Passwort erhalten Sie unter <https://fast-web-01.fast.kit.edu/Passwoerterllias/>

Termine und Nähere Informationen: siehe ILIAS oder Institutshomepage

Dates and further information will be published on the homepage of the institute.

**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.

**V****Fundamentals in the Development of Commercial Vehicles II**

2114844, SS 2025, 1 SWS, Language: German, [Open in study portal](#)

**Lecture (V)  
On-Site**

**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

**Learning Objectives:**

The students know the advantages and disadvantages of different drives. Furthermore they are familiar with components, such as transfer box, propeller shaft, powered and non-powered frontaxle etc. Beside other mechanical components, such as chassis, axle suspension and braking system, also electric and electronic systems are known. Consequently the student are able to analyze and to judge the general concepts as well as to adjust them precisely with the area of application.

**Organizational issues**

Genaue Termine sowie nähere Informationen und eventuelle Terminänderungen:

siehe Institutshomepage.

**Literature**

1. HILGERS, M.: Nutzfahrzeugtechnik lernen, Springer Vieweg, ISSN: 2510-1803
2. SCHITTLER, M.; HEINRICH, R.; KERSCHBAUM, W.: Mercedes-Benz Baureihe 500 – neue V-Motoren generation für schwere Nutzfahrzeuge, MTZ 57 Nr. 9, S. 460 ff, 1996
3. Robert Bosch GmbH (Hrsg.): Bremsanlagen für Kraftfahrzeuge, VDI-Verlag, Düsseldorf, 1. Auflage, 1994
4. RUBI, V.; STRIFLER, P. (Hrsg. Institut für Kraftfahrwesen RWTH Aachen): Industrielle Nutzfahrzeugentwicklung, Schriftenreihe Automobiltechnik, 1993
5. TEUTSCH, R.; CHERUTI, R.; GASSER, R.; PEREIRA, M.; de SOUZA, A.; WEBER, C.: Fuel Efficiency Optimization of Market Specific Truck Applications, Proceedings of the 5th Commercial Vehicle Technology Symposium – CVT 2018



**T****3.130 Course: Fundamentals of Catalytic Exhaust Gas Aftertreatment [T-MACH-105044]**

**Responsible:** Prof. Dr. Olaf Deutschmann  
 Prof. Dr. Jan-Dierk Grunwaldt  
 Dr.-Ing. Heiko Kubach  
 Hon.-Prof. Dr. Egbert Lox

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

**Competence Certificate**

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

**Prerequisites**

none

**T****3.131 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Written examination





**Credits**  
5

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	2133123	<a href="#">Fundamentals of Combustion Engine Technology</a>	2 SWS	Lecture / 	Kubach, Wagner, Toedter, Pfeil, Bernhardt, Velji
Exams					
WT 24/25	76-T-MACH-105652	<a href="#">Fundamentals of Combustion Engine Technology</a>	Kubach		
WT 24/25	76-T-MACH-105652(SP)	<a href="#">Fundamentals of Combustion Engine Technology</a>	Kubach		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 60 min.

**Prerequisites**

none

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

**V****Fundamentals of Combustion Engine Technology**

2133123, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)





**Lecture (V)**  
**On-Site**





**Content**

Fundamentals of engine processes  
 Components of combustion engines  
 Mixture formation systems  
 Gasexchange systems  
 Injection systems  
 Exhaust Gas Aftertreatment Systems  
 Cooling systems  
 Ignition Systems

## T

**3.132 Course: Fundamentals of Combustion I [T-MACH-105213]****Responsible:** Prof. Dr. Ulrich Maas**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Written examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
3

Events					
WT 24/25	2165515	<a href="#">Fundamentals of Combustion I</a>	2 SWS	Lecture / 	Maas, Shrotriya
WT 24/25	2165517	<a href="#">Fundamentals of Combustion I (Tutorial)</a>	1 SWS	Practice / 	Bykov
WT 24/25	3165016	<a href="#">Fundamentals of Combustion I</a>	2 SWS	Lecture / 	Maas
WT 24/25	3165017	<a href="#">Fundamentals of Combustion I (Tutorial)</a>	1 SWS	Practice / 	Bykov
Exams					
WT 24/25	76-T-MACH-105213	<a href="#">Fundamentals of Combustion I - german exam</a>			Maas
WT 24/25	76-T-MACH-105464	<a href="#">Fundamentals of Combustion I - english exam</a>			Maas
ST 2025	76-T-MACH-105213	<a href="#">Fundamentals of Combustion I</a>			Maas
ST 2025	76-T-MACH-105464	<a href="#">Fundamentals of Combustion I</a>			Maas

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Written exam, approx. 3 hours

**Prerequisites**

T-MACH-114043 and T-MACH-113998 must not have started

**Workload**

120 hours

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

## V

**Fundamentals of Combustion I**2165515, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

- Fundamental concepts and phenomena
- Experimental analysis of flames
- Conservation equations for laminar flat flames
- Chemical reactions
- Chemical kinetics mechanisms
- Laminar premixed flames
- Laminar diffusion flames
- Ignition processes
- NO<sub>x</sub> formation
- Formation of hydrocarbons and soot

**Organizational issues**

Bei zu wenigen Hörern wird die Lehrveranstaltung mit der englischen Lehrveranstaltung zusammengelegt.

**Literature**

Vorlesungsskript,

Buch Verbrennung - Physikalisch-Chemische Grundlagen, Modellbildung, Schadstoffentstehung, Autoren: U. Maas, J. Warnatz, R.W. Dibble, Springer-Lehrbuch, Heidelberg 1996

**Fundamentals of Combustion I (Tutorial)**2165517, WS 24/25, 1 SWS, Language: German, [Open in study portal](#)**Practice (Ü)  
On-Site****Literature**

- Vorlesungsskript
- J. Warnatz; U. Maas; R.W. Dibble: Verbrennung, Springer, Heidelberg 1996

**Fundamentals of Combustion I**3165016, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)  
On-Site****Content**

- Fundamental concepts and phenomena
- Experimental analysis of flames
- Conservation equations for laminar flat flames
- Chemical reactions
- Chemical kinetics mechanisms
- Laminar premixed flames
- Laminar diffusion flames
- Ignition processes
- NO<sub>x</sub> formation
- Formation of hydrocarbons and soot

**Literature**

Vorlesungsskript,

Buch Verbrennung - Physikalisch-Chemische Grundlagen, Modellbildung, Schadstoffentstehung, Autoren: U. Maas, J. Warnatz, R.W. Dibble, Springer-Lehrbuch, Heidelberg 1996

## T



**3.133 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	8	Grade to a third	Each summer term	1

Events					
ST 2025	2130927	<a href="#">Fundamentals of Energy Technology</a>	3 SWS	Lecture / 	Cheng, Badea
ST 2025	3190923	<a href="#">Fundamentals of Energy Technology</a>	3 SWS	Lecture / 	Badea
Exams					
WT 24/25	76-T-MACH-105220	<a href="#">Fundamentals of Energy Technology</a>	Badea, Cheng		
ST 2025	76-T-MACH-105220	<a href="#">Fundamentals of Energy Technology</a>	Cheng, Badea		
ST 2025	76-T-MACH-105220 Fundamentals of Energy Technology		<a href="#">Fundamentals of Energy Technology</a>	Badea	

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

Written examination, 90 min

### Prerequisites

none

### Workload

240 hours

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

## V

**Fundamentals of Energy Technology**

2130927, SS 2025, 3 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

### Content

The objective of the course is to train the students on state of the art knowledge about the challenging fields of energy industry and the permanent competition between the economical profitability and the long-term sustainability. The students obtain basic knowledge on thermodynamics relevant to the energy sector and comprehensive knowledge on the energy sector: demand, energy types, energy mix, installations for energy production (conventional, nuclear and renewable), transport and energy storage, environmental impact and future tendencies. Students are able to use methods of economic efficiency optimization for the energy sector in a creative way, practice oriented, also specifically trained during the corresponding tutorial. The students are qualified for further training in energy engineering related fields and for (also research-related) professional activity in the energy sector.

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

**Fundamentals of Energy Technology**3190923, SS 2025, 3 SWS, Language: English, [Open in study portal](#)**Lecture (V)  
On-Site****Content**

The objective of the course is to train the students on state of the art knowledge about the challenging fields of energy industry and the permanent competition between the economical profitability and the long-term sustainability. The students obtain basic knowledge on thermodynamics relevant to the energy sector and comprehensive knowledge on the energy sector: demand, energy types, energy mix, installations for energy production (conventional, nuclear and renewable), transport and energy storage, environmental impact and future tendencies. Students are able to use methods of economic efficiency optimization for the energy sector in a creative way, practice oriented, also specifically trained during the corresponding tutorial. The students are qualified for further training in energy engineering related fields and for (also research-related) professional activity in the energy sector.

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

**T****3.134 Course: Fundamentals of Reactor Safety for the Operation and Dismantling  
of Nuclear Power Plants [T-MACH-105530]****Responsible:** Dr. Victor Hugo Sanchez-Espinoza**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

**Competence Certificate**

oral exam about 30 minutes

**Prerequisites**

none

**Workload**

120 hours

## T

**3.135 Course: Fusion Technology A [T-MACH-105411]**

**Responsible:** Dr. Sara Perez Martin  
Dr. Klaus-Peter Weiss

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	2169483	<a href="#">Fusion Technology A</a>	2 SWS	Lecture / Practice ( / ●)	Weiss, Perez Martin
WT 24/25	2169484	<a href="#">Exercise Fusion Technology A</a>	2 SWS	Practice / ●	Weiss, Perez Martin
Exams					
WT 24/25	76-T-MACH-105411	<a href="#">Fusion Technology A</a>			Weiss, Größle, Perez Martin
ST 2025	76-T-MACH-105411	<a href="#">Fusion Technology A</a>			Perez Martin, Rieth

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

oral exam of about 30 minutes

#### Prerequisites

T-MACH-113977 must not have been started.

#### Recommendation

appreciated is knowledge in heat and mass transfer as well as in electrical engineering,  
basic knowledge in fluid mechanics, material sciences and physics

#### Workload

120 hours

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

## V

**Fusion Technology A**

2169483, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)**  
**On-Site**



**Content**

To transfer the basic physical concepts of particle physics, fusion and nuclear fission; this includes fundamental questions such as how: What is a plasma? How can it be ignited? What is the difference between magnetic and inertial fusion? Based on this, aspects of the stability of plasmas, their control and particle transport are discussed. After characterizing the plasma, the "fire" of fusion, the confinement in magnetic fields is sketched, which are built up with the help of magnetic technology. Here, knowledge of superconductivity, production and design of magnets is imparted. A reactor operation with a plasma as energy source requires a continuous operation of a tritium and fuel cycle, which is generated by the fusion reactor itself. Since fusion plasmas require small material densities, vacuum technology plays a central role. Finally, the heat generated in the fusion power plant must be converted into a power plant process and the reaction products removed. The functional basics and the structure of these fusion-typical in-vessel components are presented and the current challenges and the state of the art are demonstrated.

The course describes the essential functional principles of a fusion reactor, beginning with plasma, magnet technology, the tritium and fuel cycle, vacuum technology and the associated material sciences. The physical basics will be taught and the engineering laws of scaling will be demonstrated. Special importance is attached to the understanding of the interfaces between the different subject areas, which essentially determine the engineering technical interpretations. Methods for identifying and evaluating the central parameters will be demonstrated. Based on the acquired perception skills, methods for the design of solution strategies will be taught and technical solutions will be identified, their weak points discussed and evaluated.

**Recommendations/Pre-knowledge:**

Basic knowledge of fluid mechanics, materials engineering and physics. Knowledge of heat and mass transfer and electrical engineering is helpful.

Presence time: 21 h

Self-study: 90 h

Oral examination:

Duration: approx. 30 minutes, aids: none

**Literature**

Innerhalb jedes Teilblockes wird eine Literaturliste der jeweiligen Fachliteratur angegeben. Zusätzlich erhalten die Studenten/-innen das Studienmaterial in gedruckter und elektronischer Version.

## T

## 3.136 Course: Fusion Technology B [T-MACH-105433]

**Responsible:** Dr. Sara Perez Martin  
Dr. Michael Rieth

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2190492	<a href="#">Fusion Technology B</a>	2 SWS	Lecture /	Perez Martin, Rieth
ST 2025	2190493	<a href="#">Übungen zu Fusionstechnologie B</a>	2 SWS	Practice /	Perez Martin, Rieth
Exams					
WT 24/25	76-T-MACH-105433	<a href="#">Fusion Technology B</a>			Jelonnek, Rieth
ST 2025	76-T-MACH-105433	<a href="#">Fusion Technology B</a>			Jelonnek

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

oral exam of about 30 minutes

#### Prerequisites

none

#### Recommendation

attendance of fusion technology A lecture

reliable capability to use fundamental knowledge communicated in the bachelor study in physics, material sciences , electrical engineering and engineering design

#### Annotation

none

#### Workload

120 hours

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

## V

## Fusion Technology B

2190492, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

Lecture (V)  
On-Site

**Content**

Fusion Technology B is a continuation of Fusion Technology A lecture and includes the following topics:

Fusion neutronics, materials science of thermally and neutronicallly highly loaded components, reactor scaling and safety as well as plasma heating and current drive. The section fusion neutronics develops the basics of fusion neutronics and its calculation methods, the nuclear physical design of a fusion reactor and the corresponding components (blankets, shielding, activation, tritium breeding ratio and dose rate). Since both neutron fluxes and area power density in a fusion power plant are significantly higher than those of other power plants, they require special materials. After an extension of existing material knowledge by fundamentals and methods for the calculation of radiation damage in materials, strategies for the material selection of functional and structural materials are shown and deepened by examples. The arrangement of components close to the plasma in a fusion power plant means changed requirements for system integration and energy conversion; these questions are the subject of the block reactor scaling and safety. In addition to the explanation of the safety objectives, the methods for achieving the objectives and the computational tools required to achieve them are dealt with in particular. To ignite the plasma, extreme temperatures of several million degrees are required. Special plasma heating methods are used for this purpose, such as electron cyclotron resonance heating (ECRH), ion cyclotron resonance heating (ICRH), current drive at the lower hybrid frequency and neutral particle injection. Their basic mode of action, design criteria, transmission options and performance are presented and discussed. In addition, the heating processes can also be used for plasma stabilization. Some considerations and limitations are presented.

The lecture, which runs over 2 semesters, is aimed at students of engineering sciences and physics after the bachelor. The aim is an introduction to the current research and development on fusion and its long-term goal of a promising energy source. After a short insight into fusion physics, the lecture focuses on key technologies for a future fusion reactor. The lecture will be accompanied by exercises at Campus Nord (block event, 2-3 afternoons per topic).

**Recommendations/Prerequisites:**

Knowledge of physics, heat and mass transfer, and design theory taught in the bachelor's degree. Attendance of the lecture Fusion technology A

Presence time: 21 h

Self-study: 49 h

Oral proof of participation in the exercises

Duration: approx. 25 minutes, aids: none

**Literature**

Lecture notes

McCracken, Peter Scott, Fusion, The Energy of Universe, Elsevier Academic Press, ISBN: 0-12-481851-X


## T





**3.137 Course: Gear Cutting Technology [T-MACH-102148]**

**Responsible:** Hon.-Prof. Dr. Markus Klaiber  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

Events					
WT 24/25	2149655	<a href="#">Gear Technology</a>	2 SWS	Lecture / 	Klaiber
Exams					
WT 24/25	76-T-MACH-102148	<a href="#">Gear Technology</a>			Klaiber

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Oral Exam (20 min)

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Gear Technology**

2149655, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
On-Site

**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.

**Learning Outcomes:**

The students ...

- can describe the basic terms of gearings and are able to explain the imparted basics of the gearwheel and gearing theory.
- are able to specify the different manufacturing processes and machine technologies for producing gearings. Furthermore they are able to explain the functional principles and the dis-/advantages of these manufacturing processes.
- can apply the basics of the gearing theory and manufacturing processes on new problems.
- are able to read and interpret measuring records for gearings. are able to make an appropriate selection of a process based on a given application
- can describe the entire process chain for the production of toothed components and their respective influence on the resulting workpiece properties.

**Workload:**

regular attendance: 21 hours

self-study: 99 hours

**Literature**

**Medien:**

Skript zur Veranstaltung wird über (<https://ilias.studium.kit.edu/>) bereitgestellt.

**Media:**

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

**T****3.138 Course: Global Logistics [T-MACH-105379]****Responsible:** Prof. Dr.-Ing. Kai Furmans**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

**Competence Certificate**

oral exam (approx. 20 min)


**Prerequisites**





none

**Workload**

120 hours

**T****3.139 Course: Global Production and Logistics - Part 1: Global Production [T-MACH-105158]****Responsible:** Prof. Dr.-Ing. Gisela Lanza**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Written examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
2

Events					
WT 24/25	2149613	<a href="#">Global Production</a>	2 SWS	Lecture / 	Lanza, Benfer
Exams					
WT 24/25	76-T-MACH-110991	<a href="#">Global Production</a>	Lanza		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Written Exam (60 min)

**Prerequisites**

"T-MACH-108848 - Globale Produktion und Logistik - Teil 1: Globale Produktion" must not be commenced.

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Global Production**2149613, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**Blended (On-Site/Online)**

### Content

The lecture examines the management of global production networks of manufacturing companies. It gives an overview of the influencing factors and challenges of global production. In-depth knowledge of common methods and procedures for planning, designing and managing global production networks is imparted.

Therefore, the lecture first of all discusses the connections and interdependencies between the business strategy and the production strategy and illustrates necessary tasks for the definition of a production strategy. Methods for site selection, for the site-specific adaptation of product design and production technology as well as for the establishment of new production sites and for the adaptation of existing production networks to changing framework conditions are subsequently taught within the context of the design of the network footprint. With regard to the management of global production networks, the lecture addresses challenges associated with coordination, procurement and order management in global networks. The lecture is complemented by a discussion on the use of industry 4.0 applications in global production and current trends in planning, designing and managing global production networks.

The topics include:

- Basic conditions and influencing factors of global production (historical development, targets, chances and threats)
- Framework for planning, designing and managing global production networks
- Production strategies for global production networks
  - From business strategy to production strategy
  - Tasks of the production strategy (product portfolio management, circular economy, planning of production depth, production-related research and development)
- Design of global production networks
  - Basic types of network structures
  - Planning process for the design of the network footprint
  - Adaptation of the network footprint
  - Site selection
  - Location-specific adaptation of production technology and product design
- Management of global production networks
  - Network coordination
  - Procurement process
  - Order management
- Trends in planning, designing and managing global production networks

### Learning Outcomes:

The students ...

- can explain the general conditions and influencing factors of global production
- are capable to apply defined procedures for site selection and to evaluate site decisions with the help of different methods
- are able to select the adequate scope of design for siteappropriate production and product construction casespecifically
- can state the central elements in the planning process of establishing a new production site.
- are capable to make use of the methods to design and scale global production networks for company-individual problems
- are able to show up the challenges and potentials of the departments sales, procurement as well as research and development on global basis.

### Workload:

regular attendance: 21 hours

self-study: 99 hours

### Recommendations:

Combination with Global Production and Logistics – Part 2

### Literature

#### Medien

Skript zur Veranstaltung wird über (<https://ilias.studium.kit.edu/>) bereitgestellt

empfohlene Sekundärliteratur:

Abele, E. et al: Handbuch Globale Produktion, Hanser Fachbuchverlag, 2006 (deutsch)

#### Media

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


recommended secondary literature:





Abele, E. et al: Global Production – A Handbook for Strategy and Implementation, Springer 2008 (english)



**T****3.140 Course: Global Production and Logistics - Part 2: Global Logistics [T-MACH-105159]****Responsible:** Prof. Dr.-Ing. Kai Furmans**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	2

Events					
ST 2025	2149600	<a href="#">Global Logistics</a>	2 SWS	Lecture / 	Furmans

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

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

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Global Logistics**2149600, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
On-Site**

**Content****Content:**

Characteristics of global trade

- Incoterms
- Customs clearance, documents and export control

Global transport and shipping

- Maritime transport, esp. container handling
- Air transport

Modeling of supply chains

- SCOR model
- Value stream analysis

Location planning in cross-border-networks

- Application of the Warehouse Location Problem
- Transport Planning

Inventory Management in global supply chains

- Stock keeping policies
- Inventory management considering lead time and shipping costs

**Media:**

presentations, black board

**Workload:**

regular attendance: 21 hours

self-study: 99 hours

**Students are able to:**

- assign basic problems of planning and operation of global supply chains and plan them with appropriate methods,
- describe requirements and characteristics of global trade and transport, and
- evaluate characteristics of the design from logistic chains regarding their suitability.

**Exam:**

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

The main exam is offered every summer semester. A second date for the exam is offered in winter semester only for students that did not pass the main exam.

**Literature****Weiterführende Literatur:**

- Arnold/Isermann/Kuhn/Tempelmeier. HandbuchLogistik, Springer Verlag, 2002 (Neuaufgabe in Arbeit)
- Domschke. Logistik, Rundreisen und Touren, Oldenbourg Verlag, 1982
- Domschke/Drexl. Logistik, Standorte, OldenbourgVerlag, 1996
- Gudehus. Logistik, Springer Verlag, 2007
- Neumann-Morlock. Operations-Research, Hanser-Verlag, 1993
- Tempelmeier. Bestandsmanagement in SupplyChains, Books on Demand 2006
- Schönsleben. IntegralesLogistikmanagement, Springer, 1998

**3.141 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

Events					
WT 24/25	2113807	<a href="#">Handling Characteristics of Motor Vehicles I</a>	2 SWS	Lecture /	Unrau
Exams					
WT 24/25	76-T-MACH-105152	<a href="#">Handling Characteristics of Motor Vehicles I</a>			Unrau

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Verbally

Duration: 30 up to 40 minutes

Auxiliary means: none

**Prerequisites**

none

**Workload**

120 hours

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

**Handling Characteristics of Motor Vehicles I**

2113807, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
Online

**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

**Learning Objectives:**

The students know the basic connections between drivers, vehicles and environment. They can build up a vehicle simulation model, with which forces of inertia, aerodynamic forces and tyre forces as well as the appropriate moments are considered. They have proper knowledge in the area of tyre characteristics, since a special meaning comes to the tire behavior during driving dynamics simulation. Consequently they are ready to analyze the most important influencing factors on the driving behaviour and to contribute to the optimization of the handling characteristics.

**Organizational issues**

*Die Vorlesung wird als Videostream zur Verfügung gestellt. Sie finden den Videostream und das Vorlesungsmaterial auf ILIAS. Das ILIAS-Passwort erhalten Sie unter <https://fast-web-01.fast.kit.edu/Passwoerterliias/>*

**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.: Umdrucksammlung zur Vorlesung Fahreigenschaften von Kraftfahrzeugen I


## T



**3.142 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2114838	<a href="#">Handling Characteristics of Motor Vehicles II</a>	2 SWS	Lecture / 	Unrau
Exams					
WT 24/25	76-T-MACH-105153	<a href="#">Handling Characteristics of Motor Vehicles II</a>			Unrau

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Oral Examination

Duration: 30 up to 40 minutes

Auxiliary means: none

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Handling Characteristics of Motor Vehicles II**

2114838, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
Online

**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

Learning Objectives:

The students have an overview of common test methods, with which the handling of vehicles is gauged. They are able to interpret results of different stationary and transient testing methods. Apart from the methods, with which e.g. the driveability in curves or the transient behaviour from vehicles can be registered, also the influences from cross-wind and from uneven roadways on the handling characteristics are well known. They are familiar with the stability behavior from single vehicles and from vehicles with trailer. Consequently they are ready to judge the driving behaviour of vehicles and to change it by specific vehicle modifications.

**Organizational issues**

*Die Vorlesung wird als Videostream zur Verfügung gestellt. Sie finden den Videostream und das Vorlesungsmaterial auf ILIAS. Das ILIAS-Passwort erhalten Sie unter <https://fast-web-01.fast.kit.edu/Passwoerterliias/>*

**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.: Umdrucksammlung zur Vorlesung Fahreigenschaften von Kraftfahrzeugen II

## T



**3.143 Course: Heat and Mass Transfer [T-MACH-105292]**





**Responsible:** Prof. Dr. Ulrich Maas  
Dr.-Ing. Chunkan Yu

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each term	1

Events					
WT 24/25	2165512	<a href="#">Heat and mass transfer</a>	2 SWS	Lecture / 	Yu, Maas
WT 24/25	2165513	<a href="#">Heat and Mass Transfer (Tutorial)</a>	2 SWS	Practice / 	Yu, Maas, Bykov
Exams					
WT 24/25	76-T-MACH-105292	<a href="#">Heat and Mass Transfer</a>	Maas		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Written exam, approx. 3 h

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Heat and mass transfer**

2165512, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

- Steady and unsteady heat transfer in homogenous materials; Plates, pipe sections and spherical shells
- Molecular diffusion in gases; analogies between heat conduction and mass diffusion
- Convective, forced heat transfer in pipes/channels and around plates and profiles.
- Convective mass transfer, heat-/mass transfer analogy
- Multi phase convective heat transfer (condensation, evaporation)
- Radiative heat transfer

**Literature**

- Maas ; 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

## V

**Heat and Mass Transfer (Tutorial)**

2165513, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)**  
**On-Site**

## T


### 3.144 Course: Heat Transfer and Cooling at Thermally Highly Loaded Components [T-MACH-113362]





**Responsible:** Prof. Dr.-Ing. Hans-Jörg Bauer  
Dr.-Ing. Jonas Schmid

**Organisation:** KIT Department of Mechanical Engineering  
Institute of Thermal Turbomachinery

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2170466	<a href="#">Heat Transfer and Cooling at Thermally Highly Loaded Components</a>	2 SWS	Lecture / 	Bauer, Schmid
Exams					
WT 24/25	76-T-MACH-113362	<a href="#">Heat Transfer and Cooling at Thermally Highly Loaded Components</a>			Schmid
ST 2025	76-T-MACH-113362	<a href="#">Heat Transfer and Cooling at Thermally Highly Loaded Components</a>			Schmid

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

#### Competence Certificate

oral exam, approx. 30 min.

#### Prerequisites

none

#### Annotation

*Workload:*

regular attendance: 30 h

self-study: 90 h

#### Workload

120 hours

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

## V

### Heat Transfer and Cooling at Thermally Highly Loaded Components

2170466, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

Lecture (V)  
On-Site

**Content****Teaching Content:**

Thermally highly loaded components can be found in several fields of application: The hot gas temperatures of **modern gas turbines** and **jet engines** exceed the maximum tolerable temperatures by several hundreds of Kelvin. By increasing the power density of electric motors and the related power electronics in the field of **e-mobility**, the surface, available for lost heat rejection, is reduced. Furthermore, the temperature of the **battery** must be kept within a tight range to achieve an efficient operation. To ensure reliability of lifetime and operational safety, complex cooling technology must be applied.

First, the basics of forced convection and thermal radiation will be introduced in this lesson. Based on that various cooling methods will be presented. Specific pros and cons will be identified and new concepts for further improvement of cooling will be discussed. Subsequently, the capability of the introduced cooling methods is supported by practical applications. Finally, experimental and numerical methods for the characterization of heat transfer will be presented.

**Workload:**

regular attendance: 30 h

self-study: 90 h

**Learning Objectives:**

The students are able to:

- outline the basics of forced convection, thermal radiation and film cooling
- name, analyse and differentiate between different cooling methods
- judge the advantages and disadvantages of cooling methods and discuss approaches for the improvement of complex cooling methods
- design cooling concepts for thermally highly loaded components in a simplified manner
- name and rate the experimental and numerical methods for the characterisation of heat transfer

**Exam:**


oral exam, approximately 30 minutes, no tools or reference materials may be used during the exam

**Language:** German



## T

**3.145 Course: Heat Transfer in Nuclear Reactors [T-MACH-105529]****Responsible:** Prof. Dr.-Ing. Xu Cheng**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2189907	<a href="#">Flow and heat transfer in nuclear reactors</a>	2 SWS	Lecture / 	Cheng
Exams					
WT 24/25	76-T-MACH-105529	<a href="#">Heat Transfer in Nuclear Reactors</a>			Cheng

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, 20 min

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Flow and heat transfer in nuclear reactors**2189907, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

This lecture is designed for students of mechanical engineering and other engineering disciplines in their Bachelor or Master studies. The students will understand the most important heat transfer processes and learn the methods for the analysis of flow and heat transfer in nuclear reactors. Students are capable of explaining the thermal-hydraulic processes occurring in nuclear reactors and of selecting suitable models or simulation codes for thermal-hydraulic design and analysis.

1. Reactor types and thermal-hydraulic design criteria
2. Heat transfer processes and modeling
3. Pressure drop calculation
4. Temperature distribution in nuclear reactor
5. Numerical analysis methods for nuclear reactor thermal-hydraulics

**Organizational issues**

This compact English lecture will be given on February 10 - 12, 2025, 09:00-17:00.

in seminar room of the Institute IATF, Building 07.08, Room 331

**Literature**

1. L.S. Tong, J. Weisman, Thermal-hydraulics of pressurized water reactors, American Nuclear Society, La Grande Park, Illinois, USA
2. R.T. Lahey, F.J. Moody, The Thermal-Hydraulics of a Boiling Water Nuclear Reactor, 2nd edition, ANS, La Grande Park, Illinois, USA, 1993

**3.146 Course: Heatpumps [T-MACH-105430]**

**Responsible:** Prof. Dr. Ulrich Maas  
Dr. Heiner Wirbser

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
WT 24/25	2166534	<a href="#">Heatpumps</a>	2 SWS	Lecture /	Wirbser
ST 2025	2166534	<a href="#">Heatpumps</a>	2 SWS	Lecture /	Wirbser
Exams					
WT 24/25	76-T-MACH-105430	<a href="#">Heatpumps</a>			Maas, Wirbser
ST 2025	76-T-MACH-105430	<a href="#">Heatpumps</a>			Maas, Wirbser

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Oral exam (20 min)

**Prerequisites**

none

**Workload**

120 hours

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

**Heatpumps**

2166534, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

The aim of this lecture is to promote heat pumps as heating systems for small and medium scale facilities and to discuss their advantages as well as their drawbacks. After considering the actual energy situation and the political requirements the different aspects of heat pumps are elucidated. The requirements concerning heat sources, the different components and the various types of heat pumps are discussed. In addition ecological and economical aspects are taken into consideration. The coupling of heat pumps with heat accumulators in heating systems will also be part of the lecture.

**Literature**

Vorlesungsunterlagen

Bach, K.: Wärmepumpen, Bd. 26 Kontakt und Studium, Lexika Verlag, 1979

Kirn, H., Hadenfeldt, H.: Wärmepumpen, Bd. 1: Einführung und Grundlagen, Verlag C. F. Müller, 1987

von Cube, H.L.: Lehrbuch der Kältetechnik, Verlag C.F. Müller, Karlsruhe, 1975.

von Cube, H.L., Steimle, F.: Wärmepumpen, Grundlagen und Praxis VDI-Verlag, Düsseldorf, 1978.

**Heatpumps**

2166534, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

The aim of this lecture is to promote heat pumps as heating systems for small and medium scale facilities and to discuss their advantages as well as their drawbacks. After considering the actual energy situation and the political requirements the different aspects of heat pumps are elucidated. The requirements concerning heat sources, the different components and the various types of heat pumps are discussed. In addition ecological and economical aspects are taken into consideration. The coupling of heat pumps with heat accumulators in heating systems will also be part of the lecture.

**Literature**

Vorlesungsunterlagen

Bach, K.: Wärmepumpen, Bd. 26 Kontakt und Studium, Lexika Verlag, 1979

Kim, H., Hadenfeldt, H.: Wärmepumpen, Bd. 1: Einführung und Grundlagen, Verlag C. F. Müller, 1987

von Cube, H.L.: Lehrbuch der Kältetechnik, Verlag C.F. Müller, Karlsruhe, 1975.

von Cube, H.L., Steimle, F.: Wärmepumpen, Grundlagen und Praxis VDI-Verlag, Düsseldorf, 1978.

**T****3.147 Course: High Performance Computing [T-MACH-105398]**

**Responsible:** Prof. Dr. Britta Nestler  
Dr.-Ing. Michael Selzer

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Written examination

**Credits**  
5

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
3

Events					
WT 24/25	2183721	<a href="#">High Performance Computing</a>	2 SWS	Lecture / Practice ( / X	Nestler, Selzer

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

At the end of the semester, there will be a written exam (90 min).

**Prerequisites**

none

**Recommendation**

preliminary knowledge in mathematics, physics and materials science

regular participation in the additionally offered computer exercises

**Workload**

150 hours

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

**V****High Performance Computing**

2183721, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)**  
**Cancelled**

**Content****PLEASE NOTE: This lecture is only offered in the winter semester!**

Topics of the high performance computing course are:

- architectures of parallel platforms
- parallel programming models
- performance analysis of concurrent programs
- parallelization models
- MPI and OpenMP
- Monte-Carlo method
- 1D & 2D heat diffusion
- raycasting
- n-body problem
- simple phase-field models

The student

- can explain the foundations and strategies of parallel programming
- can efficiently apply high performance computers for simulations by elaborating respective parallelisation techniques.
- has an overview of typical applications and the specific requirements for parallelization.
- knows the concepts of parallelisation and is capable to apply these to efficiently use high performance computing resources and the growing performance of multi core processors in science and industry.
- has experiences in programming of parallel algorithms through integrated computer exercises.

preliminary knowledge in mathematics, physics and materials science recommended

regular attendance: 22,5 hours lecture, 11,5 hours exercises

self-study: 116 hours

We regularly discuss exercises at the computer.

At the end of the semester, there will be a written exam.

**Organizational issues**

Dieser Kurs findet im Wintersemester 2024/2025 nicht statt.

**Literature**

1. Vorlesungsskript; Übungsaufgabenblätter; Programmgerüste
2. Parallele Programmierung, Thomas Rauber, Gudula Rügnier; Springer 2007

**3.148 Course: High Performance Powder Metallurgy Materials [T-MACH-102157]****Responsible:** apl. Prof. Dr. Günter Schell**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2126749	<a href="#">Advanced powder metals</a>	2 SWS	Lecture /	Schell
Exams					
WT 24/25	76-T-MACH-102157	<a href="#">High Performance Powder Metallurgy Materials</a>	Schell, Wagner		
ST 2025	76-T-MACH-102157	<a href="#">High Performance Powder Metallurgy Materials</a>	Schell		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam, 20- 30 min

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***Advanced powder metals**2126749, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**Blended (On-Site/Online)****Literature**

- 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. Thümmel, R. Oberacker. "Introduction to Powder Metallurgy", Institute of Materials, 1993


## T



**3.149 Course: High Temperature Materials [T-MACH-105459]**

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

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	2

Events					
WT 24/25	2174605	<a href="#">High Temperature Materials</a>	2 SWS	Lecture / 	Heilmaier
Exams					
WT 24/25	76-T-MACH-105459	<a href="#">High Temperature Materials</a>			Heilmaier
ST 2025	76-T-MACH-105459	<a href="#">High Temperature Materials</a>			Heilmaier

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**  
 Oral exam, about 25 minutes

**Prerequisites**  
 none

**Workload**  
 120 hours

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

## V

**High Temperature Materials**

2174605, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

- Phenomenology of High Temperature Deformation
- Deformation Mechanisms
- High Temperature Structural Materials

**learning objectives:**

Students are able to


- Define properly the term "high temperature" with respect to materials
- Describe the shape of the creep curve based on underlying deformation mechanisms
- Rationalize the influence of relevant parameters such as temperature, stress, microstructure on the high temperature deformation behavior
- Develop strategies for improving creep resistance of alloys via modifying their composition
- Select properly industrially relevant high temperature structural materials for various applications





**Literature**

B. Ilshner, Hochtemperaturplastizität, Springer-Verlag, Berlin

M.E. Kassner, Fundamentals of Creep in Metals and Alloys, Elsevier, Amsterdam, 2009

**T****3.150 Course: Holistic Approach of Managing Power Plant Operation under Uncertainty and Volatility [T-MACH-112238]****Responsible:** Dr. Marcus Seidl**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 24/25	2189405	<a href="#">Holistic approach of managing power plant operation under uncertainty and volatility</a>	2 SWS	Lecture / 	Seidl
Exams					
WT 24/25	76-T-MACH-112238	<a href="#">Holistic approach of managing power plant operation under uncertainty and volatility</a>			Seidl

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam of about 30 minutes

**Prerequisites**

none

**Annotation**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Holistic approach of managing power plant operation under uncertainty and volatility**2189405, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**Online**



## **Content**

### **Main Contents:**

The structure of electricity markets  
Requirements from network operators  
The basics of commodity markets  
The impact of regulation on power plant operation  
The role of behavioral economics in power plant decision making  
Integration of renewable energy sources into the electricity market  
Calibration of power plant operation and maintenance to market requirements  
Asset management for power plant fleets  
Applying financial engineering to optimize asset utilization  
Day-to-day decision making for power plant operation

The lecture provides an overview of the many practical aspects of power plant operation. For this purpose, the knowledge of the energy and commodity markets, the regulatory boundary conditions, the energy trading instruments, the principles of fleet management and the requirements of power plant maintenance are required.

For the purpose of an efficient management of a power plant fleet it is explained how a variety of statistical models can be used to determine the optimal combination of resource purchases, outage management, load availability and ask prices.

Each credit point equals to 25-30 h working time of a student. Thereby, the time is based on an average student finishing with an average score. The working time can be split into: 1 attendance of the lectures, 2. pre- and post-processing of the lecture, 3 preparations for examination.

Students understand the many aspects of power plant operation: the structure of the energy and commodity markets, the regulatory boundary conditions, the energy trading instruments, the principles of fleet management and the requirements of power plant maintenance.

Furthermore, students can develop on their own a suitable strategy for the management of a power plant fleet.

Oral exam of about 25 min.

## **Literature**

G. Balzer, C. Schorn, Asset Management für Infrastrukturanlagen - Energie und Wasser, VDI



R. Weron, Modeling and Forecasting Electricity Loads and Prices: A Statistical Approach, Wiley





D. Edwards, Energy Trading and Investing: Trading, Risk Management and Structuring Deals in the Energy Market, McGraw-Hill

T

**3.151 Course: Homework 'Basics of Finite Elements' [T-BGU-109908]****Responsible:** Prof. Dr.-Ing. Peter Betsch**Organisation:** KIT Department of Civil Engineering, Geo and Environmental Sciences**Part of:** [M-MACH-105405 - Courses of the KIT Department of Civil Engineering, Geo and Environmental Sciences](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each winter term	1

Events					
WT 24/25	6215901	<a href="#">Grundlagen Finite Elemente</a>	2 SWS	Lecture / 	Franke
WT 24/25	6215902	<a href="#">Übungen zu Grundlagen Finite Elemente</a>	2 SWS	Practice / 	Reiff
Exams					
WT 24/25	8243109908	<a href="#">Homework 'Basics of Finite Elements'</a>			Betsch

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

processing of three exercise sheets

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**Workload**

30 hours

## T

**3.152 Course: Human Factors Engineering I (Workplace Design) [T-MACH-114175]****Responsible:** Prof. Dr.-Ing. Barbara Deml**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Written examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1**Competence Certificate**

Written exam, duration 60 minutes

**Prerequisites**

none

**Workload**

120 hours

**T****3.153 Course: Human Factors Engineering II (Organizational Design) [T-MACH-114176]****Responsible:** Prof. Dr.-Ing. Barbara Deml**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type
Written examination

Credits
4

Grading scale
Grade to a third

Recurrence
Each winter term

Version
1

**Competence Certificate**

written exam, 60 minutes

**Prerequisites**

none

**Workload**


120 hours





## T

**3.154 Course: Human-Machine-Interaction [T-INFO-101266]**

**Responsible:** Prof. Dr.-Ing. Michael Beigl  
**Organisation:** KIT Department of Informatics  
**Part of:** [M-MACH-104883 - Courses of the KIT Department of Informatics](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each summer term	3

Events					
ST 2025	24659	<a href="#">Human-Computer-Interaction</a>	2 SWS	Lecture / 	Beigl, Lee
Exams					
WT 24/25	7500076	<a href="#">Human-Machine-Interaction</a>	Beigl		
ST 2025	7500048	<a href="#">Human-Machine-Interaction</a>	Beigl		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 60 minutes.

**Prerequisites**

Participation in the exercise is compulsory and the contents of the exercise are relevant for the examination.

**Modeled Conditions**



The following conditions have to be fulfilled:





1. The course [T-INFO-106257 - Human-Machine-Interaction Pass](#) must have been passed.

T

**3.155 Course: Human-Machine-Interaction Pass [T-INFO-106257]****Responsible:** Prof. Dr.-Ing. Michael Beigl**Organisation:** KIT Department of Informatics**Part of:** [M-MACH-104883 - Courses of the KIT Department of Informatics](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	0	pass/fail	Each summer term	1

Events					
ST 2025	2400095	<a href="#">Human-Computer-Interaction</a>	1 SWS	Practice / 	Beigl, Lee
ST 2025	24659	<a href="#">Human-Computer-Interaction</a>	2 SWS	Lecture / 	Beigl, Lee
Exams					
ST 2025	7500121	<a href="#">Human-Machine-Interaction</a>			Beigl

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

The assessment is carried out as an examination of another type (§ 4 Abs. 2 No. 3 SPO).

Exercise sheets must be handed in regularly to pass the course. The specific details will be announced in the lecture.

**Prerequisites**



None.





**Annotation**

Participation in the exercise is compulsory and the contents of the exercise are relevant for the examination.

T


**3.156 Course: Hybrid and Electric Vehicles [T-ETIT-100784]****Responsible:** Prof. Dr. Martin Doppelbauer**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Written examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1





Events					
WT 24/25	2306321	<a href="#">Hybrid and Electric Vehicles</a>	2 SWS	Lecture / 	Doppelbauer
WT 24/25	2306323	<a href="#">Tutorial for 2306323 Hybrid and Electric Vehicles</a>	1 SWS	Practice / 	Doppelbauer
Exams					
WT 24/25	7306321	<a href="#">Hybrid and Electric Vehicles</a>			Doppelbauer
ST 2025	7306321	<a href="#">Hybrid and Electric Vehicles</a>			Doppelbauer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Prerequisites**

none

**T****3.157 Course: Hydraulic Fluid Machinery [T-MACH-105326]****Responsible:** Dr. Balazs Pritz**Organisation:** KIT Department of Mechanical Engineering  
Institute of Thermal Turbomachinery**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
8**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
1

Events					
ST 2025	2157432	<a href="#">Hydraulic Fluid Machinery</a>	4 SWS	Lecture / 	Pritz
Exams					
WT 24/25	76-T-MACH-105326	<a href="#">Hydraulic Fluid Machinery</a>			Pritz
ST 2025	76-T-MACH-105326	<a href="#">Hydraulic Fluid Machinery</a>			Pritz

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, 40 min.

**Prerequisites**

None.

**Workload**

240 hours

*Below you will find excerpts from events related to this course:***V****Hydraulic Fluid Machinery**2157432, SS 2025, 4 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site**



**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

**Recommendations:**

3154510 – Fluid Mechanics I

3153511 – Fluid Mechanics II

Students get to know the basics of hydraulic fluid machinery (pumps, fans, hydroturbines, windturbines, hydrodynamic transmissions) in general. Application of the knowledge in different fields of engineering.

The lecture introduces the basics of Hydraulic Fluid Machinery. The different types and shapes are presented. The basic equations for the preservation of mass, momentum and energy are discussed. Velocity schemes in typical cascades are shown, the Euler equation of fluid machinery and performance characteristics are deduced.

Similarities and dimensionless parameters are discussed. Fundamental aspects of operation and cavitation are shown.

Students are able to understand the working principle of Hydraulic Fluid Machinery as well as the interaction with typical systems, in which they are integrated.

regular attendance: 56 hours

self-study: 150 hours

preparation for exam: 40 hours

Oral or written examination (see announcement)

No tools or reference materials may be used during the exam.

**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. Pfeleiderer, 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

**3.158 Course: Hydrogen as Energy Carrier [T-CHEMBIO-112317]****Responsible:** Prof. Dr. Helmut Ehrenberg**Organisation:** KIT Department of Chemistry and Biosciences**Part of:** [M-MACH-106252 - Courses of the KIT Department of Chemistry and Biosciences](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	4	Grade to a third	Each winter term	1 terms	1

Exams			
WT 24/25	7100039	<a href="#">Hydrogen as Energy Carrier</a>	Ehrenberg

**Competence Certificate**


Oral exam, about 25 minutes





**Workload**

120 hours

**T****3.159 Course: Hydrogen in Materials – Exercises and Lab Course [T-MACH-112159]****Responsible:** Dr. rer. nat. Stefan Wagner**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	4	pass/fail	Each summer term	1 terms	2

Events					
ST 2025	2173584	<a href="#">Hydrogen in Materials – Exercises and Lab Course</a>	2 SWS	Practice / 	Wagner
Exams					
ST 2025	76-T-MACH-112159	<a href="#">Hydrogen in Materials – Exercises and Lab Course</a>	Wagner		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Regular participation and participating in lab course, protocol included.

**Prerequisites**

none

**Workload**


120 hours

*Below you will find excerpts from events related to this course:***V****Hydrogen in Materials – Exercises and Lab Course**2173584, SS 2025, 2 SWS, Language: English, [Open in study portal](#)**Practice (Ü)  
On-Site****Content**

In this exercise with lab course the contents of the lecture “Hydrogen in Materials: from Energy Storage to Hydrogen Embrittlement” are deepened. The students know the differences in thermodynamics and kinetics of the hydrogen interaction with storage materials and construction materials. The students can describe the hydrogen interaction with microstructural defects in materials, and they know the resulting effects on the materials' mechanical integrity. Based on this, the students can express the requirements of the respective materials classes and transfer them to engineering applications.





Utilizing proper experimental setups, the students can measure hydrogen induced stresses in materials as well as the hydrogens' diffusivity and its chemical potential. From the measurement data, the students can construct metal-hydrogen phase diagrams, and they can qualitatively assess the defect density in the metal.

**T****3.160 Course: Hydrogen in Materials: from Energy Storage to Hydrogen Embrittlement [T-MACH-110923]****Responsible:** Prof. Dr. Astrid Pundt**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
2**Events**

ST 2025	2173588	<a href="#">Hydrogen in Materials: from Energy Storage to Hydrogen Embrittlement</a>	2 SWS	Lecture / 	Pundt, Wagner
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**Exams**

WT 24/25	76-T-MACH-110923	<a href="#">Hydrogen in Materials: from Energy Storage to Hydrogen Embrittlement</a>	Pundt
ST 2025	76-T-MACH-110923	<a href="#">Hydrogen in Materials: from Energy Storage to Hydrogen Embrittlement</a>	Pundt

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral exam, about 25 minutes

**Prerequisites**

T-MACH-108853 - Wasserstoff in Materialien has not been started

T-MACH-110957 - Wasserstoff in Materialien: von der Energiespeicherung zur Materialversprödung has not been started

**Annotation**

in English

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Hydrogen in Materials: from Energy Storage to Hydrogen Embrittlement**2173588, SS 2025, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**On-Site**

**Content**

This lecture teaches physical and chemical basics of hydrogen adsorption and absorption of different materials. It trains the understanding of the specific lattice positions that hydrogen occupies within solids, and its impact on material properties. A thermodynamical approach yields Sievert's law, allowing the students to describe the different solubilities of hydrogen (and other gases) in solid materials. Further thermodynamic data can be obtained using van't Hoff plots of phase transformation pressures. The impact of ternary alloy components, as described by semi-empirical models, will be recognized. The specific mobility of hydrogen in materials will be understood, which divides into classical diffusion and quantum mechanical tunneling processes. The students can describe the interaction of hydrogen with defects in crystal lattices, which is of special interest for properties of nano-scale materials or for the hydrogen embrittlement of steels. Basic embrittlement models can be explained by the students. Actual hydrogen storage systems can be summarized.

**learning objectives:**

- o Hydrogen as energy storage – the hydrogen cycle and safety issues
- o methods for hydrogen charging of materials and hydrogen detection
- o Hydrogen adsorption at and absorption in different solids, Sievert's law
- o interstitial lattice sites and lattice expansion
- o Hydrides, van't Hoff plots, phase transitions, M-H binary phase diagrams
- o ternary alloy effects
- o hydrogen mobility in materials: interstitial diffusion and quantum mechanical tunneling
- o interaction of hydrogen with defects
- o hydrogen embrittlement of steels, different embrittlement models
- o hydrogen in nano-scale systems and new storage materials

**Literature**

Literaturhinweise und Unterlagen in der Vorlesung



### 3.161 Course: Hydrogen Technologies [T-MACH-105416]

**Responsible:** Olaf Jedicke  
Dr. Thomas Jordan

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	2

Events					
ST 2025	2170495	<a href="#">Hydrogen Technologies</a>	2 SWS	Lecture /	Jordan, Jedicke

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

Written exam, Duration: 90 minutes

Auxiliary: no tools or reference materials may be used during the exam

#### Prerequisites

none

#### Recommendation

Fundamentals Thermodynamics

#### Workload

120 hours

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



### Hydrogen Technologies

2170495, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

The course content is the cross-cutting issue of hydrogen as energy carrier. After successful participation the students may reflect on the fundamental technological basis of an energy system using predominantly hydrogen as an energy carrier or energy storage. Based on this knowledge they may objectify the principle idea of a hydrogen economy.

The students know the fundamental physical and chemical properties of hydrogen and may apply their knowledge on thermodynamics to compare efficiencies of different solutions with hydrogen. They can list, compare and evaluate established and future solutions for production, storage and distribution of hydrogen. They can explain advantages and disadvantages of using hydrogen in conventional combustion processes versus using hydrogen in different fuel cells. In particular they can describe the specific safety aspects related to hydrogen, compare them with other energy vectors and evaluate different measures for risk mitigation.

- Basic concepts
- Production
- Transport and storage
- Application
- Safety aspects

#### Literature

Ullmann's Encyclopedia of Industrial Chemistry

Hydrogen and Fuel Cells, Ed. S. Stolten, Wiley-VCH, 2010, ISBN 978-3-527-32711-9

**3.162 Course: Industrial Aerodynamics [T-MACH-105375]**

**Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel  
Dr.-Ing. Stefan Kröber

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

Events					
WT 24/25	2153425	<a href="#">Industrial aerodynamics</a>	2 SWS	/	Kröber, Frohnäpfel
Exams					
WT 24/25	76-T-MACH-105375	<a href="#">Industrial Aerodynamics</a>	Kröber		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam - 30 minutes

**Prerequisites**

none

**Workload**

120 hours

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

**Industrial aerodynamics**

2153425, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Blended (On-Site/Online)**

**Content**

This compact lecture deals with flows and aeroacoustics with significance in vehicle development. A special focus is set on the optimization of external vehicle aerodynamics and the presentation of modern industrial wind tunnel technology. The second major thematic block includes both, aeroacoustic basics principles and practical examples of aeroacoustics, especially in the field of automotive technology. These fields are explained in their phenomenology, the corresponding theories are discussed and the tools for measurement and simulation are introduced and demonstrated. This lecture focusses on industry relevant methods for analyses and descriptions of forces, aeroacoustic sound fields, flow structures and turbulence. In addition, an overview of numerical methods for industrial applications is given. The integration and interconnection of the methods in the development processes are discussed exemplary.

An excursion to the Mercedes-Benz AG wind tunnel and the research and development centers is planned.

- Introduction
- Aerodynamics of bluff bodies
- Industrial flow measurement techniques and modern wind tunnel technology
- Overview of flow simulation in automotive industry
- Vehicle aerodynamics
- Passenger comfort of roadsters and cabriolets
- Soiling of road vehicles
- Aeroacoustics: basic principles and practical examples of aeroacoustics, especially in the field of automotive technology including aeroacoustic measurement techniques and numerical methods

Students can describe the different properties of aerodynamics and aeroacoustics of vehicles flows. They are qualified to analyze external flows around the vehicles and aeroacoustic sound fields of vehicles.

**Organizational issues**


Blockvorlesung - Anmeldung erfolgt über das Sekretariat, max. Teilnehmerzahl sind 20 Studierende.




**Literature**

Vorlesungsskript

T

**3.163 Course: Industrial Circuitry [T-ETIT-100716]****Responsible:** Dr.-Ing. Andreas Liske**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2306327	<a href="#">Industrial Circuitry</a>	2 SWS	Lecture / 	Liske
Exams					
WT 24/25	7306327	<a href="#">Industrial Circuitry</a>	Liske		

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Prerequisites**

none



**T****3.164 Course: Information Systems and Supply Chain Management [T-MACH-102128]****Responsible:** Dr.-Ing. Christoph Kilger**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	3	Grade to a third	Each summer term	3

**Competence Certificate**

The success control takes place in form of a written examination (60 min) during the semester break (according to §4(2), 1 SPO). If the number of participants is low, an oral examination (according to §4 (2), 2 SPO) may also be offered.

**Prerequisites**



none





**Workload**

90 hours

**T****3.165 Course: Innovation and Project Management in Rail Vehicle Engineering [T-MACH-113068]****Responsible:** Prof. Dr.-Ing. Martin Cichon**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	4	Grade to a third	Each term	5

Events					
WT 24/25	2115921	<a href="#">Innovation and Project Management in Rail Vehicle Engineering</a>	2 SWS	Lecture / 	Lang, Cichon
ST 2025	2115921	<a href="#">Innovation and Project Management in Rail Vehicle Engineering</a>	2 SWS	Lecture / 	Lang, Cichon
Exams					
WT 24/25	76-T-MACH-106427	<a href="#">Innovation and Project Management in Rail Vehicle Engineering</a>	Lang, Cichon		
ST 2025	76-T-MACH-106427	<a href="#">Innovation and Project Management in Rail Vehicle Engineering</a>	Lang, Cichon		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Graded examination:

2/3 of the examination: 20-minute oral examination on the content of the lecture

1/3 of the examination performance of another type: unit accompanying the lecture as part of a 10-minute presentation and a practical application from innovation and project management


**Workload**





120 hours

## T

**3.166 Course: Innovation2Business – Innovation Strategy in the Industrial Corporate Practice [T-MACH-112882]****Responsible:** Prof. Dr.-Ing. Albert Albers**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	4	Grade to a third	Each winter term	1 terms	1

Events					
WT 24/25	2145182	<a href="#">Innovation2Business – Innovation Strategy in the Industrial Corporate Practice</a>	2 SWS	Lecture / 	Albers
Exams					
WT 24/25	76-T-MACH-112882	<a href="#">Innovation2Business – innovation strategy in the industrial corporate practice</a>			Albers

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Written exam based on the lecture handout and materials, duration 90 minutes

**Prerequisites**

none

**Recommendation**

None

**Workload**

120 hours

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

## V

**Innovation2Business – Innovation Strategy in the Industrial Corporate Practice Lecture (V)**2145182, WS 24/25, 2 SWS, Language: German/English, [Open in study portal](#)**On-Site****Content**

lecture block at the Bühl &amp; Herzogenaurach locations with plant tours &amp; fireside evenings + exam-preparatory Q&amp;A.

Exam: written, limited to 30 seats (recommended for: Master's degree; mechanical engineering, industrial engineering, electrical engineering, computer science) → see module manual for details.

In this lecture series, use Schaeffler as an example to learn how global companies continuously transform themselves to grow sustainably and become

maintain a leading position in the global market in the long term through business-oriented innovation.

Together we will go through the most important elements of the innovation and development process and learn about the successes and learnings based on

vivid examples from practice.

Join the fireside evenings with the speakers to discuss the lecture content and beyond in a relaxed atmosphere.

The event is limited to 30 students and is free for you (meals, bus transfers &amp; accommodations).

**Organizational issues**

Vorlesung findet an Schaeffler-Standorten (Herzogenaurach und Bühl) statt.

Sprache: Unterlagen Englisch, Vortragssprache Deutsch

**T****3.167 Course: Innovative Nuclear Systems [T-MACH-105404]****Responsible:** Prof. Dr.-Ing. Xu Cheng**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2130973	<a href="#">Innovative Nuclear Systems</a>	2 SWS	/ ●	Cheng
Exams					
ST 2025	76-T-MACH-105404	<a href="#">Innovative Nuclear Systems</a>			Cheng

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam, 20 min

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Innovative Nuclear Systems**2130973, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**On-Site****Content**

This lecture is addressed to students of mechanical engineering, chemical engineering and physics. Goal of the lecture is the explanation of state-of-the-art development of nuclear systems. Nuclear systems, that are from today's point of view promising will be presented and explained. The main characteristics of such systems and the associated challenges are also part of the lecture.

1. state of the art and development tendencies in nuclear systems
2. advanced concepts in light water cooled systems
3. new developments in fast reactors
4. development tendencies in gas-cooled plants
5. transmutation systems for waste management
6. fusion systems

**Organizational issues**

Geb. 07.08, SR 331

Mo (14.07.2025), 09:00 bis 17:00

Di (15.07.2025), 09:00 bis 17:00

Mi (16.07.2025), 09:00 bis 17:00

## T

**3.168 Course: Innovative Project [T-MACH-109185]**

**Responsible:** apl. Prof. Dr. Andreas Class  
Prof. Dr. Orestis Terzidis

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	6	Grade to a third	Each winter term	1

**Competence Certificate**

Students have to deliver pitch-talk supported by slides to convince a community about their results. A fictive project proposal of 10 to 15 pages.

**Prerequisites**

none

**Recommendation**

Participants need to bring their own laptop with Skype installed.

Recommended English proficiency equivalent to:

- [IELTS](#) Academic test  
An overall band score of at least 6.5 (with no section lower than 5.5)
- [University of Cambridge](#)  
Certificate in Advanced English, CAE (grades A – C)  
Certificate of Proficiency in English, CPE (grades A – C)
- [TOEFL](#) Internet-based test, IBT  
A total score of at least 92, with a minimum score of 22 from the writing section

**Annotation**


The subject of the project is provided by industry partner or the innovation department from KIT or INP Grenoble. Representatives of industry partner will be addressee for the pitch-talk.


**Workload**

180 hours

**3.169 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	2

Events					
WT 24/25	2121001	<a href="#">Integrated Information Systems for engineers</a>	3 SWS	Lecture / Practice ( /  )	Elstermann
Exams					
WT 24/25	76-T-MACH-102083	<a href="#">Integrated Information Systems for Engineers</a>			Ovtcharova, Elstermann

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral examination 20 min.

**Prerequisites**

None

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***Integrated Information Systems for engineers**2121001, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)**Lecture / Practice (VÜ)  
On-Site****Content**

- Information systems, information management
- CAD, CAP and CAM systems
- PPS, ERP and PDM systems
- Knowledge management and ontology
- Process modeling

Students can:

- illustrate the structure and operating mode of information systems
- describe the structure of relational databases
- describe the fundamentals of knowledge management and its application in engineering and deploy ontology as knowledge representation
- describe different types of process modelling and their application and illustrate and execute simple work flows and processes with selected tools
- explain different goals of specific IT systems in product development (CAD, CAP, CAM, PPS, ERP, PDM) and assign product development processes

**Organizational issues**

Blockveranstaltung vom 07. - 10. Oktober

**Literature**

Vorlesungsfolien / lecture slides

**T****3.170 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
8**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
2

Events					
ST 2025	2150660	<a href="#">Integrated Production Planning in the Age of Industry 4.0</a>	6 SWS	Lecture / Practice ( / )	Lanza
Exams					
WT 24/25	76-T-MACH-108849	<a href="#">Integrated Production Planning in the Age of Industry 4.0</a>			Lanza

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**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.

**Workload**

240 hours

*Below you will find excerpts from events related to this course:***V****Integrated Production Planning in the Age of Industry 4.0**2150660, SS 2025, 6 SWS, Language: German, [Open in study portal](#)**Lecture / Practice (VÜ)  
On-Site**

**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 (PPS, process simulation as a validation tool, planning of conveyor technology and storage systems for linking production and IT systems in the I4.0 factory )
- Preparation and monitoring of implementation
- Start-up and series support

The lecture contents are complemented by numerous current practical examples with a strong Industry 4.0 reference. Aspects of sustainability are anchored in all units and thus basic knowledge of sustainable production planning is taught. Within the exercises the lecture contents are deepened and applied to specific problems and tasks.

**Learning Outcomes:**

The students ...

- can discuss basic questions of production technology.
- are able to apply the methods of integrated production planning to new problems.
- are able to analyze and evaluate the suitability of the methods, procedures and techniques for a specific problem.
- can apply the learned methods of integrated production planning to new problems.
- can use their knowledge targeted for efficient production technology.
- know the basic features of sustainable production planning and can apply underlying knowledge.

**Workload:****MACH:**

regular attendance: 63 hours

self-study: 177 hours

**WING:**

regular attendance: 63 hours

self-study: 207 hours

**Organizational issues**

Vorlesungstermine dienstags 14.00 Uhr und donnerstags 14.00 Uhr, Übungstermine donnerstags 15.45 Uhr. Bekanntgabe der konkreten Übungstermine erfolgt in der ersten Vorlesung

**Literature****Medien:**

Skript zur Veranstaltung wird über (<https://ilias.studium.kit.edu/>) bereitgestellt.


**Media:**





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



**T****3.171 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2150601	<a href="#">Integrative Strategies in Production and Development of High Performance Cars</a>	2 SWS	Lecture / 	Schlichtenmayer
Exams					
WT 24/25	76-T-MACH-105188	<a href="#">Integrative Strategies in Production and Development of High Performance Cars</a>	Schlichtenmayer		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Written Exam (60 min)

**Prerequisites**

none

**Workload**

120 hours

*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 2025, 2 SWS, Language: German, [Open in study portal](#) On-Site

**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

**Learning Outcomes:**

The students ...

- are capable to specify the current technological and social challenges in automotive industry.
- are qualified to identify interlinkages between development processes and production systems.
- are able to explain challenges and solutions of global markets and global production of premium products.
- are able to explain modern methods to identify key competences of producing companies.

**Workload:**

regular attendance: 21 hours

self-study: 99 hours

**Literature****Medien:**

Skript zur Veranstaltung wird über (<https://ilias.studium.kit.edu/>) bereitgestellt.

**Media:**

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

**T****3.172 Course: Intellectual Property Rights and Strategies in Industrial Companies [T-MACH-105442]****Responsible:** Dipl.-Ing. Frank Zacharias**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 24/25	2147161	<a href="#">Intellectual Property Rights and Strategies in Industrial Companies</a>	2 SWS	Block /	Zacharias
ST 2025	2147160	<a href="#">Patents and Patentstrategies in innovative companies</a>	2 SWS	/	Zacharias
Exams					
WT 24/25	76-T-MACH-105442	<a href="#">Intellectual Property Rights and Strategies in Industrial Companies</a>	Zacharias, Albers		
ST 2025	76-T-MACH-105442	<a href="#">Intellectual Property Rights and Strategies in Industrial Companies</a>	Zacharias		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam (ca. 20 min)

**Prerequisites**

none

**Recommendation**

None

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Intellectual Property Rights and Strategies in Industrial Companies**2147161, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Block (B)**  
**On-Site**

**Content**

Attendance at lectures (5 L): 24h

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

Preparation exam: 31h

The students understand and are able to describe the basics of intellectual property, particularly with regard to the filing and obtaining of property rights. They can name the criteria of project-integrated intellectual property management and strategic patenting in innovative companies. Students are also able to describe the key regulations of the law regarding employee invention and to illustrate the challenges of intellectual properties with reference to examples.

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

**Organizational issues**

Weitere Informationen siehe IPEK-Homepage.

[https://www.ipek.kit.edu/2976\\_2858.php](https://www.ipek.kit.edu/2976_2858.php)

**Patents and Patentstrategies in innovative companies**

2147160, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**On-Site**

**Content**

Attendance at lectures (5 L): 24h

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

Preparation exam: 31h

The students understand and are able to describe the basics of intellectual property, particularly with regard to the filing and obtaining of property rights. They can name the criteria of project-integrated intellectual property management and strategic patenting in innovative companies. Students are also able to describe the key regulations of the law regarding employee invention and to illustrate the challenges of intellectual properties with reference to examples.

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Lecture overview:

1. Introduction to intellectual property
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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

**3.173 Course: Introduction into Mechatronics [T-MACH-100535]**

**Responsible:** Andre Orth  
apl. Prof. Dr. Markus Reischl

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each winter term	2

Events					
WT 24/25	2105011	<a href="#">Introduction into Mechatronics</a>	3 SWS	Lecture /	Reischl, Orth
Exams					
WT 24/25	76-T-MACH-100535	<a href="#">Introduction into Mechatronics</a>	Reischl		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Oral exam (Duration: 2h)

**Prerequisites**

none

**Workload**

180 hours

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

**Introduction into Mechatronics**

2105011, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**

**Content****Content:**

- Introduction
- Structure of mechatronic systems
- Mathematical treatment of mechatronic systems
- Sensors and actuators
- Measurements: acquisition and interpretation
- Modelling of mechatronic systems
- Control and feedback control systems
- Information processing

**Learning objectives:**

The student has knowledge about the specific challenge of interdisciplinary collaboration within the framework of mechatronics. He is able to explain the origin, necessity and methodic implementation of interdisciplinary collaboration, to name the main difficulties as well as the special features within the development of mechatronic products from the point of view of development methodic.

The student has fundamental knowledge of modeling mechanical, hydraulically and electrically part systems and about suitable optimization methods.

The student knows the difference in use of the term "system" in mechatronic and mechanical use.


**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

**3.174 Course: Introduction to Bionics [T-MACH-111807]****Responsible:** apl. Prof. Dr. Hendrik Hölscher**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	3

Events					
ST 2025	2142151	<a href="#">Introduction to Biomimetics</a>	2 SWS	Lecture / 	Hölscher, Greiner
Exams					
WT 24/25	76-T-MACH-102172	<a href="#">Introduction into Biomimetics</a>			Hölscher

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam (duration: 60 minutes)

**Prerequisites**

none

**Annotation**

Brick T-MACH-102172 may not be started

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

## V

**Introduction to Biomimetics**2142151, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

Bionics focuses on the design of technical products following the example of nature. For this purpose we have to learn from nature and to understand its basic design rules. Therefore, the lecture focuses on the analysis of the fascinating effects used by many plants and animals. Possible implementations into technical products are discussed in the end.

The students should be able analyze, judge, plan and develop biomimetic strategies and products.

Basic knowledge in physics and chemistry

The successful attendance of the lecture is controlled by a written examination.

**Organizational issues**

Im ILIAS werden Materialien (Videos, Originalliteratur, Übungen) zur Vertiefung zur Verfügung gestellt.

Für die schriftliche Klausur werden zwei Termine angeboten (erste Woche nach Vorlesungsende im Sommersemester und eine Woche vor Vorlesungsbeginn im Wintersemester).

**Literature**

Folien und Literatur werden in ILIAS zur Verfügung gestellt.

## T

**3.175 Course: Introduction to Ceramics [T-MACH-100287]**

**Responsible:** apl. Prof. Dr. Günter Schell  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Oral examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2125757	<a href="#">Introduction to Ceramics</a>	3 SWS	Lecture / 	Schell
Exams					
WT 24/25	76-T-MACH-100287	<a href="#">Introduction to Ceramics</a>	Schell, Bucharsky, Wagner		
ST 2025	76-T-MACH-100287	<a href="#">Introduction to Ceramics</a>	Schell, Bucharsky, Wagner		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**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

**Workload**

180 hours

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

## V

**Introduction to Ceramics**

2125757, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**

**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

**3.176 Course: Introduction to Engineering Mechanics I: Statics [T-MACH-108808]****Responsible:** Prof. Dr.-Ing. Alexander Fidlin**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	3	Grade to a third	Each summer term	1

Events					
ST 2025	2162238	<a href="#">Introduction to Engineering Mechanics I: Statics and Strength of Materials</a>	2 SWS	Lecture / 	Böhlke, Kehrer
ST 2025	2162239	<a href="#">Introduction to Engineering Mechanics I: Statics and Strength of Materials (Tutorial)</a>	1 SWS	Practice / 	Luo
Exams					
WT 24/25	76-T-MACH-108808	<a href="#">Introduction to Engineering Mechanics I: Statics</a>			Fidlin
ST 2025	76-T-MACH-108808	<a href="#">Introduction to Engineering Mechanics I: Statics</a>			Fidlin

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

The assessment consists of a written examination taking place in the recess period (according to Section 4(2), 1 of the examination regulation). The examination takes place in every semester. Re-examinations are offered at every ordinary examination date.

Permitted utilities: none

**Prerequisites**

None

**Workload**

90 hours

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

## V

**Introduction to Engineering Mechanics I: Statics and Strength of Materials**2162238, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

Statics: force · moment · general equilibrium conditions · center of mass · inner force in structure · plane frameworks · theory of adhesion

## T

**3.177 Course: Introduction to Engineering Mechanics I: Statics and Strength of Materials [T-MACH-102208]****Responsible:** Prof. Dr.-Ing. Alexander Fidlin**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each summer term	2

Events					
ST 2025	2162238	<a href="#">Introduction to Engineering Mechanics I: Statics and Strength of Materials</a>	2 SWS	Lecture /	Böhlke, Kehler
ST 2025	2162239	<a href="#">Introduction to Engineering Mechanics I: Statics and Strength of Materials (Tutorial)</a>	1 SWS	Practice /	Luo
Exams					
WT 24/25	76-T-MACH-102208-1	<a href="#">Introduction to Engineering Mechanics I: Statics (75min)</a>	Fidlin		
WT 24/25	76-T-MACH-102208-2	<a href="#">Introduction to Engineering Mechanics I: Statics and Strength of Materials (120min)</a>	Fidlin		
ST 2025	76-T-MACH-102208-1	<a href="#">Introduction to Engineering Mechanics I: Statics (75 Min)</a>	Fidlin		
ST 2025	76-T-MACH-102208-2	<a href="#">Introduction to Engineering Mechanics I: Statics and Strength of Materials (120 Min)</a>	Fidlin		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

The assessment consists of a written examination (120 min) taking place in the recess period (according to Section 4(2), 1 of the examination regulation). The examination takes place in every semester. Re-examinations are offered at every ordinary examination date.

For students of economics the assesement consists of a written examination (Statics - 75 min.)

Permitted utilities: non-programmable calculator

**Prerequisites**

None

**Workload**

150 hours

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

## V

**Introduction to Engineering Mechanics I: Statics and Strength of Materials**

2162238, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

Lecture (V)  
On-Site

**Content**

Statics: force · moment · general equilibrium condistions · center of mass · inner force in structure · plane frameworks · theory of adhesion

**T****3.178 Course: Introduction to Industrial Production Economics [T-MACH-105388]****Responsible:** Simone Dürrschnabel**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

**Competence Certificate**

oral exam (approx. 30 min)

The exam is offered in German only!

**Prerequisites**

none

**Workload**

120 hours

**T****3.179 Course: Introduction to Microsystem Technology I [T-MACH-114100]**

**Responsible:** Dr. Vlad Badilita  
Prof. Dr. Jan Gerrit Korvink

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Written examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2141861	<a href="#">Introduction to Microsystem Technology I</a>	2 SWS	Lecture / 	Korvink, Badilita

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**  
written examination (60 min)

**Prerequisites**  
T-MACH-114035 and T-MACH-105182 must not have started

**Workload**  
120 hours

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

**V****Introduction to Microsystem Technology I**

2141861, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Literature**

Mikrosystemtechnik für Ingenieure, W. Menz und J. Mohr, VCH Verlagsgesellschaft, Weinheim 2005

M. Madou

Fundamentals of Microfabrication

Taylor & Francis Ltd.; Auflage: 3. Auflage. 2011



### 3.180 Course: Introduction to Microsystem Technology II [T-MACH-114101]

**Responsible:** Dr. Vlad Badilita  
Prof. Dr. Jan Gerrit Korvink

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2142874	<a href="#">Introduction to Microsystem Technology II</a>	2 SWS	Lecture /	Korvink, Badilita

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

written examination (60 min)

#### Prerequisites

T-MACH-114035 and T-MACH-105183 must not have started

#### Workload

120 hours

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



### Introduction to Microsystem Technology II

2142874, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

- Introduction in Nano- and Microtechnologies
- Lithography
- LIGA-technique
- Mechanical microfabrication
- Patterning with lasers
- Assembly and packaging
- Microsystems

#### Organizational issues

Topic: Grundlagen der Mikrosystemtechnik II (MST II) SS 21

**Time: Thursdays 14:00 - 15:30**

[10.91 Redtenbacher-Hörsaal](#)

#### Literature

Menz, W., Mohr, J., O. Paul: Mikrosystemtechnik für Ingenieure, VCH-Verlag, Weinheim, 2005

M. Madou

Fundamentals of Microfabrication

Taylor & Francis Ltd.; Auflage: 3. Auflage. 2011

**T****3.181 Course: Introduction to Multi-Body Dynamics [T-MACH-105209]****Responsible:** Prof. Dr.-Ing. Alexander Fidlin**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each summer term	2

Exams				
WT 24/25	76-T-MACH-105209	<a href="#">Introduction into the Multi-Body Dynamics</a>	Fidlin	

**Competence Certificate**

Written examination, 180 min.

**Prerequisites**

none

**Recommendation**

Engineering Mechanics III/IV

**Workload**

150 hours



### 3.182 Course: Introduction to Nanotechnology [T-MACH-111814]

**Responsible:** apl. Prof. Dr. Hendrik Hölscher

**Organisation:** KIT Department of Mechanical Engineering  
KIT Department of Economics and Management

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	2

Events					
ST 2025	2142152	<a href="#">Introduction to Nanotechnology</a>	2 SWS	Lecture /	Hölscher
Exams					
WT 24/25	76-T-MACH-105180	<a href="#">Introduction into Nanotechnology</a>			Hölscher, Dienwiebel

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

written exam 90 min

#### Prerequisites

none

#### Annotation

Brick T-MACH-111814 may not be started

#### Workload

120 hours

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



### Introduction to Nanotechnology

2142152, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

Nanotechnology deals with the fabrication and analysis of nanostructures. The topics of the lecture include

- the most common measurement principles of nanotechnology especially scanning probe methods
- the analysis of physical and chemical properties of surfaces
- interatomic forces and their influence on nanostructures
- methods of micro- and nanofabrication and lithography
- basic models of contact mechanics and nanotribology
- important functional characteristics of nanodevices

Basic knowledge in mathematics and physics is assumed

The successful attendance of the lecture is controlled by a 30 minutes oral exam.

#### Organizational issues


Es werden im ILIAS Materialien (Videos, Originalliteratur, Übungen) zur Vertiefung zur Verfügung gestellt.





Für die mündlichen Prüfungen werden zwei Termine angeboten (erste Woche nach Vorlesungsende im Sommersemester und eine Woche vor Vorlesungsbeginn im Wintersemester).

#### Literature

Alle Folien und Originalliteratur werden auf ILIAS zur Verfügung gestellt.

**T****3.183 Course: Introduction to Neutron Cross Section Theory and Nuclear Data Generation [T-MACH-105466]****Responsible:** apl. Prof. Dr. Ron Dagan**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
1

Events					
ST 2025	2190490	<a href="#">Introduction to Neutron Cross Section Theory and Nuclear Data Generation</a>	2 SWS	Lecture / 	Dagan
Exams					
WT 24/25	76-T-MACH-105466	<a href="#">Introduction to Neutron Cross Section Theory and Nuclear Data Generation</a>			Dagan
ST 2025	76-T-MACH-105466	<a href="#">Introduction to Neutron Cross Section Theory and Nuclear Data Generation</a>			Dagan

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam of about 30 minutes

**Prerequisites**

none

**Annotation**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Introduction to Neutron Cross Section Theory and Nuclear Data Generation**2190490, SS 2025, 2 SWS, Language: German/English, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

Cross section characterization

Summary of basic cross section theory

Resonance cross section

Doppler broadening

Scattering kernels

Basic of slowing down theory

Unit cell based XS data generation

Cross sections Data libraries

Data Measurements

The students:

- Understand the special importance of cross sections in various domains of natural science (Reactor physics, Material research, Solar radiation etc.)
- Are familiar with the theoretical methods and experimental effort to generate cross sections data.

Regular attendance: 26 h

self study: 94 h

oral exam about 30 min.





**Literature**





Handbuch von Nuklearen Reaktoren Vol I . Y. Ronen CRC press 1986 (in English)

D. Emendorfer, K.H. Höcker Theorie der Kernreaktoren, Teil I, II BI- Hochschultaschenbücher 1969

P. Tipler, R. Llewellyn Modern Physics 2008 (in English)

**T****3.184 Course: Introduction to Nonlinear Vibrations [T-MACH-105439]****Responsible:** Prof. Dr.-Ing. Alexander Fidlin**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
7**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2162247	<a href="#">Introduction to Nonlinear Vibrations</a>	2 SWS	Lecture / 	Fidlin
WT 24/25	2162248	<a href="#">Introduction into the nonlinear vibrations (Tutorial)</a>	2 SWS	Practice / 	Fidlin, Singhal

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, 30 min.

**Prerequisites**

none

**Recommendation**

Vibration theory, Mathematical Methods of Vibration Theory, Dynamic Stability

**Workload**

210 hours

*Below you will find excerpts from events related to this course:***V****Introduction to Nonlinear Vibrations**2162247, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****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


**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 Engineering. 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.

**Introduction into the nonlinear vibrations (Tutorial)**2162248, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Practice (Ü)  
On-Site****Content**

Exercises related to the lecture

**T****3.185 Course: Introduction to Nuclear Energy [T-MACH-105525]****Responsible:** Prof. Dr.-Ing. Xu Cheng**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2189903	<a href="#">Introduction to Nuclear Energy</a>	2 SWS	Lecture / 	Cheng
Exams					
WT 24/25	76-T-MACH-105525	<a href="#">Introduction to Nuclear Energy</a>			Cheng

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, 30 min

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Introduction to Nuclear Energy**2189903, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

This lecture is dedicated to students of mechanical engineering and other engineering Bachelor or Master degree courses. Goal of the lecture is the fundamental knowledge of nuclear energy and nuclear reactors. After the lecture the students understand the principle of the usage of nuclear energy, the structure and operation of nuclear power plants and nuclear safety measures. Furthermore, the students are capable of giving technical assessment of the usage of nuclear energy with respect to its safety and sustainability.

## T

**3.186 Course: Introduction to Operations Research I and II [T-WIWI-102758]**

**Responsible:** Prof. Dr. Stefan Nickel  
Prof. Dr. Steffen Rebennack  
Prof. Dr. Oliver Stein

**Organisation:** KIT Department of Economics and Management

**Part of:** [M-MACH-104884 - Courses of the KIT Department of Economics and Management](#)








**Type**  
Written examination





**Credits**  
9

**Grading scale**  
Grade to a third

**Recurrence**  
see Annotations

**Version**  
2

Events					
WT 24/25	2500030	<a href="#">Computer Exercises on Introduction to Operations Research II</a>	1 SWS	Tutorial ( /  )	Dunke
WT 24/25	2530043	<a href="#">Introduction to Operations Research II</a>		Lecture / 	Nickel
WT 24/25	2530044			Tutorial ( /  )	Dunke
WT 24/25	2550043	<a href="#">Introduction to Operations Research II</a>		Lecture / 	Nickel
ST 2025	2500008	<a href="#">Computer Exercises on Introduction to Operations Research I</a>	1 SWS	Tutorial ( /  )	Dunke
ST 2025	2550040	<a href="#">Introduction to Operations Research I</a>	2 SWS	Lecture / 	Stein
ST 2025	2550043	<a href="#">Tutorials on Introduction to Operations Research I</a>	2 SWS	Tutorial ( /  )	Dunke
Exams					
WT 24/25	00060	<a href="#">Introduction to Operations Research I and II</a>			Nickel

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

The assessment of the module is carried out by a written examination (120 minutes) according to Section 4(2), 1 of the examination regulation.

In each term (usually in March and August), one examination is held for both courses.

The overall grade of the module is the grade of the written examination.

### Prerequisites

None

### Recommendation

Knowledge of Mathematics I and II is recommended, as well as programming knowledge for the software laboratory.

It is strongly recommended to attend the course Introduction to Operations Research I

[2550040] before attending the course Introduction to Operations Research II

[2530043].

### Workload

270 hours

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

## V

**Introduction to Operations Research II**

2530043, WS 24/25, SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

Integer and combinatorial optimization: basic concepts, cutting plane methods, branch-and-bound methods, branch-and-cut methods, heuristic methods.

Nonlinear optimization: basic concepts, optimality conditions, solution methods for convex and nonconvex optimization problems.

Dynamic and stochastic models and methods: Dynamic optimization, Bellman methods, lot-sizing models and dynamic and stochastic models of inventory, queues.

**Learning Objectives:**

The student

- knows and describes the basic concepts of integer and combinatorial optimization, nonlinear optimization and dynamic optimization,
- knows the methods and models indispensable for a quantitative analysis,
- models and classifies optimization problems and selects appropriate solution procedures to solve simple optimization problems independently,
- validates, illustrates and interprets obtained solutions.

**Literature**

- Nickel, Stein, Waldmann: Operations Research, 2. Auflage, Springer, 2014
- Hillier, Lieberman: Introduction to Operations Research, 8th edition. McGraw-Hill, 2005
- Murty: Operations Research. Prentice-Hall, 1995
- Neumann, Morlock: Operations Research, 2. Auflage. Hanser, 2006
- Winston: Operations Research - Applications and Algorithms, 4th edition. PWS-Kent, 2004

**Introduction to Operations Research II**

2550043, WS 24/25, SWS, Language: German, [Open in study portal](#)

**Lecture (V)  
On-Site**

**Content**

Integer and Combinatorial Programming: Basic notions, cutting plane methods, branch and bound methods, branch and cut methods, heuristics.

Nonlinear Programming: Basic notions, optimality conditions, solution methods for convex and nonconvex optimization problems.

Dynamic and stochastic models and methods: dynamical programming, Bellman method, lot sizing models, dynamical and stochastic inventory models, queuing theory.

**Learning objectives:**

The student

- names and describes basic notions of integer and combinatorial optimization, nonlinear programming, and dynamic programming,
- knows the indispensable methods and models for quantitative analysis,
- models and classifies optimization problems and chooses the appropriate solution methods to solve optimization problems independently,
- validates, illustrates and interprets the obtained solutions.

**Literature**

- Nickel, Stein, Waldmann: Operations Research, 2. Auflage, Springer, 2014
- Hillier, Lieberman: Introduction to Operations Research, 8th edition. McGraw-Hill, 2005
- Murty: Operations Research. Prentice-Hall, 1995
- Neumann, Morlock: Operations Research, 2. Auflage. Hanser, 2006
- Winston: Operations Research - Applications and Algorithms, 4th edition. PWS-Kent, 2004

**Introduction to Operations Research I**

2550040, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)  
On-Site**

**Content**

Examples for typical OR problems.

Linear Programming: Basic notions, simplex method, duality, special versions of the simplex method (dual simplex method, three phase method), sensitivity analysis, parametric optimization, game theory.

Graphs and Networks: Basic notions of graph theory, shortest paths in networks, project scheduling, maximal and minimal cost flows in networks.

**Learning objectives:**

The student

- names and describes basic notions of linear programming as well as graphs and networks,
- knows the indispensable methods and models for quantitative analysis,
- models and classifies optimization problems and chooses the appropriate solution methods to solve optimization problems independently,
- validates, illustrates and interprets the obtained solutions.

**Literature**

- Nickel, Rebennack, Stein, Waldmann: Operations Research, 3. Auflage, Springer, 2022
- Hillier, Lieberman: Introduction to Operations Research, 8th edition. McGraw-Hill, 2005
- Murty: Operations Research. Prentice-Hall, 1995
- Neumann, Morlock: Operations Research, 2. Auflage. Hanser, 2006
- Winston: Operations Research - Applications and Algorithms, 4th edition. PWS-Kent, 2004



### 3.187 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	3	Grade to a third	Each summer term	4

Events					
ST 2025	2162282	<a href="#">Introduction to the Finite Element Method</a>	2 SWS	Lecture /	Langhoff, Böhlke

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

written exam (90 min)

prerequisites: passing the corresponding "Tutorial to Introduction to the Finite element method" (T-MACH-110330)

#### Prerequisites

Passing the "Tutorial to Introduction to the Finite element method" (T-MACH-110330) is a prerequisite for taking part in the exam.

#### Modeled Conditions

The following conditions have to be fulfilled:

1. The course [T-MACH-110330 - Tutorial Introduction to the Finite Element Method](#) must have been passed.

#### Annotation

Knowledge of the contents of the courses "Continuum Mechanics of Solids and Fluids" and "Mathematical Methods of Continuum Mechanics" as well as the corresponding tutorials are expected

Due to capacity reasons it is possible that not all students of this course can be admitted to the computer tutorials. Students of the bachelor's degree program in mechanical engineering who have chosen the Major Field Continuum Mechanics (SP-Nr 13) will be admitted to the computer tutorials in any case.

If additional places are available in the computer tutorials for this course, these will be allocated according to the BSc average grade.

#### Workload

90 hours

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



#### Introduction to the Finite Element Method

2162282, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

Lecture (V)  
On-Site

#### Content

- introduction and motivation, elements of tensor calculus
- Discrete FEM: systems of bars and springs
- Formulations of boundary value problems (1D)
- Approximations in FEM
- FEM for scalar and vector-valued field problems
- Solution methods for linear systems of equations




**Literature**





- Fish, J., Belytschko, T.: A First Course in Finite Elements, Wiley 2007
- Jung, M., Langer, U.: Methode der finiten Elemente für Ingenieure: Eine Einführung in die numerischen Grundlagen und Computersimulation, Teubner 2013
- Braess, D.: Finite Elemente -- Theorie, schnelle Löser und Anwendungen in der Elastizitätstheorie, Springer 2013
- Gustafsson, B.: Fundamentals of Scientific Computing, Springer 2011

## T

**3.188 Course: Introduction to Theory of Materials [T-MACH-105321]****Responsible:** apl. Prof. Marc Kamlah**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2182732	<a href="#">Introduction to Theory of Materials</a>	2 SWS	Lecture / 	Kamlah
Exams					
WT 24/25	76-T-MACH-105321	<a href="#">Introduction to Theory of Materials</a>			Kamlah
ST 2025	76-T-MACH-105321	<a href="#">Introduction to Theory of Materials</a>			Kamlah

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam

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

## V

**Introduction to Theory of Materials**2182732, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

Following a brief introduction into continuum mechanics at small deformations, the classification into elastic, viscoelastic, plastic and viscoplastic constitutive models of solids is discussed. Then, one after the other, the four groups of elastic, viscoelastic, plastic and viscoplastic constitutive models are motivated and mathematically formulated. Their properties are demonstrated by means of elementary analytical solutions and examples.

The student can judge for a problem to be computed, which constitutive model should be selected depending on choice of material and loading. For computation tools such as commercial finite element codes, the students can understand the documentation with respect to the implemented constitutive models, and they can make their choice based on their knowledge. The students have basic knowledge for the development of constitutive laws.

Qualification: Engineering Mechanics; Advanced Mathematics

regular attendance: 22,5 hours

self-study: 97,5 hours

oral exam ca. 30 minutes

**Literature**

[1] Peter Haupt: Continuum Mechanics and Theory of Materials, Springer

[2] Skript




### 3.189 Course: IoT Platform for Engineering [T-MACH-106743]





**Responsible:** Prof. Dr.-Ing. Jivka Ovtcharova

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	4	Grade to a third	Each term	2

Events					
WT 24/25	2123352	<a href="#">IoT platform for engineering</a>	3 SWS	Project (P /  )	Meyer, Maier, Rönnau
Exams					
WT 24/25	76T-MACH-106743	<a href="#">IoT platform for engineering</a>	Meyer		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

#### Competence Certificate

Assessment of another type (graded), Group teaching project on Industry 4.0 consisting of: Conception, implementation, accompanying documentation and final presentation.

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



#### IoT platform for engineering

2123352, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Project (PRO)**  
**On-Site**

#### Content

Industry 4.0, IT systems for fabrication and assembly, process modelling and execution, project work in teams, practice-relevant I4.0 problems, in automation, manufacturing industry and service.

Students can

- map and analyze processes in the context of Industry 4.0 with special methods of process modelling
- collaboratively grasp practical I4.0 issues using existing hardware and software and work out solutions for a continuous improvement process in a team
- prototypically implement the self-developed solution proposal with the given IT systems and the existing hardware equipment and finally present the results

#### Organizational issues

Auftakt: Mi 23 Okt 10:00h - G20.20 (EG) R061

#### Literature

Keine / None


**T****3.190 Course: Lab Computer-Aided Methods for Measurement and Control [T-MACH-105341]**





**Responsible:** Jonas Merkert  
Prof. Dr.-Ing. Christoph Stiller

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each winter term	1

Events					
WT 24/25	2137306	<a href="#">Lab Computer-aided methods for measurement and control</a>	3 SWS	Practical course / 	Stiller
Exams					
WT 24/25	76-T-MACH-105341	<a href="#">Lab Computer-Aided Methods for Measurement and Control</a>	Stiller		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Colloquia

**Prerequisites**

none

**Workload**

120 hours

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

**V****Lab Computer-aided methods for measurement and control**

2137306, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Practical course (P)  
On-Site**

**Content****Lerninhalt (EN):**

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.

**Voraussetzungen: Recommendations:**

Basic studies and preliminary examination; basic lectures in automatic control

**Arbeitsaufwand (EN):** 120 hours

**Lernziele (EN):**

Powerful and cheap computation resources have led to major changes in the domain of measurement and control. Engineers in various fields are nowadays confronted with the application of computer-aided methods. This lab tries to give an insight into the modern domain of measurement and control by means of practically oriented and flexible experiments. Based on experiments on measurement instrumentation and digital signal processing, elementary knowledge in the domain of visual inspection and image processing will be taught. Thereby, commonly used software like MATLAB/Simulink will be used in both simulation and realization of control loops. The lab closes with selected applications, like control of a robot or supersonic computer tomography.

**Nachweis (EN):**

Colloquia

**Literature**

Übungsanleitungen sind auf der Institutshomepage erhältlich.

Instructions to the experiments are available on the institute's website

**3.191 Course: Laboratory Exercise in Energy Technology [T-MACH-105331]**

**Responsible:** Prof. Dr.-Ing. Hans-Jörg Bauer  
Prof. Dr. Ulrich Maas  
Dr.-Ing. Heinrich Wirbser

**Organisation:** KIT Department of Mechanical Engineering

Institute of Thermal Turbomachinery

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Completed coursework

**Credits**  
4

**Grading scale**  
pass/fail

**Recurrence**  
Each term

**Version**  
1

Events					
WT 24/25	2171487	<a href="#">Laboratory Exercise in Energy Technology</a>	3 SWS	Practical course /	Bauer, Maas, Bykov
ST 2025	2171487	<a href="#">Laboratory Exercise in Energy Technology</a>	3 SWS	Practical course /	Bauer, Maas, Bykov, Schießl
Exams					
WT 24/25	76-T-MACH-105331	<a href="#">Laboratory Exercise in Energy Technology</a>	Bauer, Maas, Wirbser, Bykov		
ST 2025	76-T-MACH-105331	<a href="#">Laboratory Exercise in Energy Technology</a>	Bauer, Maas, Wirbser		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

1 report, approx. 12 pages

Discussion of the documented results with the assistants

**Prerequisites**

none

**Workload**

120 hours

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

**Laboratory Exercise in Energy Technology**

2171487, WS 24/25, 3 SWS, Language: German/English, [Open in study portal](#)

**Practical course (P)**  
**On-Site**

**Content**

Online registration within the first two weeks of the lecture periode at: <http://www.its.kit.edu>

- 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

regular attendance: 42h

self-study: 78h

Attending this course enables the students to:

- accomplish experimental and design related as well as theoretical tasks in a scientific background
- perform a correct evaluation of the obtained results
- adequately document and present their results in a scientific framework

1 report, approx. 12 pages

Discussion of the documented results with the assistants

Duration: 30 minutes

no tools or reference materials may be used

**Laboratory Exercise in Energy Technology**

2171487, SS 2025, 3 SWS, Language: German/English, [Open in study portal](#)

**Practical course (P)**  
**On-Site**

**Content**

Online registration within the first two weeks of the lecture periode at: <http://www.its.kit.edu>

- 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

regular attendance: 42h

self-study: 78h

Attending this course enables the students to:

- accomplish experimental and design related as well as theoretical tasks in a scientific background
- perform a correct evaluation of the obtained results
- adequately document and present their results in a scientific framework

1 report, approx. 12 pages

Discussion of the documented results with the assistants

Duration: 30 minutes

no tools or reference materials may be used

**Organizational issues**

Information zum Lehlabor finden Sie auf der Instituts-homepage



## T

**3.192 Course: Laboratory Laser Materials Processing [T-MACH-102154]**

**Responsible:** Dr.-Ing. Johannes Schneider  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)



**Type**  
Completed coursework





**Credits**  
4

**Grading scale**  
pass/fail

**Recurrence**  
Each term

**Version**  
2

Events					
WT 24/25	2183640	<a href="#">Laboratory "Laser Materials Processing"</a>	3 SWS	Practical course / 	Schneider, Pfleging
ST 2025	2183640	<a href="#">Laboratory "Laser Materials Processing"</a>	3 SWS	Practical course / 	Schneider, Pfleging
Exams					
WT 24/25	76-T-MACH-102154	<a href="#">Laboratory Laser Materials Processing</a>	Schneider		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**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 is assumed.

**Workload**

120 hours

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

## V

**Laboratory "Laser Materials Processing"**

2183640, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Practical course (P)**  
**Blended (On-Site/Online)**

**Content**

The laboratory comprises 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<sub>2</sub>-, excimer-, Nd:YAG- and high power diode-laser sources within the laboratory.

The student

- can describe the influence of laser, material and process parameters and can choose suitable parameters for the most important methods of laser-based processing in automotive engineering.
- can explain the requirements for safe handling of laser radiation and for the design of safe laser systems.

Basic knowledge of physics, chemistry and material science is assumed.

The attendance to one of the courses Physical Basics of Laser Technology (2181612) or Laser Application in Automotive Engineering (2182642) is strongly recommended.

regular attendance: 34 hours

self-study: 86 hours

The assessment consists of a colloquium for every single experiment and an overall final colloquium incl. an oral presentation of 20 min.

**Organizational issues**

Maximal 16 Teilnehmer/innen!

Es sind nur noch wenige Plätze frei (Stand 31.05.2024)! Registrierung für die Nachrückliste möglich per Email an [johannes.schneider@kit.edu](mailto:johannes.schneider@kit.edu)

Praktikum findet in Kleingruppen semesterbegleitend (dienstags bzw. mittwochs, halbtägig) auf dem Campus Nord am IAM-AWP (Geb. 681) und auf dem Campus Süd am IAM-CMS (Geb. 30.48) statt!

Termine werden mit den Teilnehmern/innen direkt abgestimmt.

**Literature**

F. K. Kneubühl, M. W. Sigrist: Laser, 2008, Vieweg+Teubner

T. Graf: Laser - Grundlagen der Laserstrahlquellen, 2009, Vieweg-Teubner Verlag

R. Poprawe: Lasertechnik für die Fertigung, 2005, Springer

H. Hügel, T. Graf: Laser in der Fertigung, 2009, Vieweg+Teubner

J. Eichler, H.-J. Eichler: Laser - Bauformen, Strahlführung, Anwendungen, 2006, Springer

**Laboratory "Laser Materials Processing"**

2183640, SS 2025, 3 SWS, Language: German, [Open in study portal](#)

**Practical course (P)**  
**Blended (On-Site/Online)**

**Content**

The laboratory comprises 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<sub>2</sub>-, excimer-, Nd:YAG- and high power diode-laser sources within the laboratory.

The student

- can describe the influence of laser, material and process parameters and can choose suitable parameters for the most important methods of laser-based processing in automotive engineering.
- can explain the requirements for safe handling of laser radiation and for the design of safe laser systems.

Basic knowledge of physics, chemistry and material science is assumed.

The attendance to one of the courses Physical Basics of Laser Technology (2181612) or Laser Application in Automotive Engineering (2182642) is strongly recommended.

regular attendance: 34 hours

self-study: 86 hours

The assessment consists of a colloquium for every single experiment and an overall final colloquium incl. an oral presentation of 20 min.

**Organizational issues**

Die Praktikumsplätze für das Sommersemester 2025 sind bereits ausgebucht!

Anmeldung für die Nachrückliste per Email an [johannes.schneider@kit.edu](mailto:johannes.schneider@kit.edu)

Das Praktikum findet semesterbegleitend in Kleingruppen am IAM-ZM (CS) bzw. IAM-AWP (CN) statt!

Die Termine werden zu Beginn des Semesters bekannt gegeben.

**Literature**

F. K. Kneubühl, M. W. Sigrist: Laser, 2008, Vieweg+Teubner

T. Graf: Laser - Grundlagen der Laserstrahlquellen, 2009, Vieweg-Teubner Verlag

R. Poprawe: Lasertechnik für die Fertigung, 2005, Springer

H. Hügel, T. Graf: Laser in der Fertigung, 2009, Vieweg+Teubner

J. Eichler, H.-J. Eichler: Laser - Bauformen, Strahlführung, Anwendungen, 2006, Springer

W.T. Silfvast: Laser Fundamentals, 2008, Cambridge University Press

W.M. Steen: Laser Materials Processing, 2010, Springer

## T


**3.193 Course: Laboratory Mechatronics [T-MACH-105370]**





**Responsible:** Prof. Dr. Veit Hagenmeyer  
Prof. Dr.-Ing. Christoph Stiller

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each winter term	4

Events					
WT 24/25	2105014	<a href="#">Laboratory mechatronics</a>	3 SWS	Practical course / 	Hagenmeyer, Stiller, Chen, Orth
Exams					
WT 24/25	76-T-MACH-105370	<a href="#">Laboratory Mechatronics</a>	Stiller, Hagenmeyer		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

The laboratory course is offered exclusively as ungraded course work. The assessment consists of a group colloquium at the beginning of the individual specialization phases (Part 1). In addition, a robot control system for a pick-and-place task must be successfully implemented in the group phase (Part 2).

**Prerequisites**

None

**Workload**

120 hours

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

## V

**Laboratory mechatronics**

2105014, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Practical course (P)**  
**On-Site**

**Content****Part I**

Control, programming and simulation of robots  
CAN-Bus communication  
Image processing / machine vision

**Part II**

Solution of a complex problem in team work

**Learning objectives:**

The student is able to ...

- use his knowledge about mechatronics and microsystems technology to solve a practical problem. The laboratory course comprises simulation, bus communication, measurement instrumentation, control engineering and programming.
- integrate the different subsystems from a manipulator to a working compound system in teamwork.

Nachweis (EN): certificate of successful attendance

Voraussetzung (EN): none

Arbeitsaufwand (EN):

regular attendance: 33.5 h

self-study: 88.5 h

**Organizational issues**

Das Praktikum ist anmeldepflichtig.



Die Anmeldemodalitäten/-fristen werden auf <https://www.iai.kit.edu/Pruefungen.php> bekannt gegeben.





**Literature**

Materialien zum Mechatronik-Praktikum

Manuals for the laboratory course on Mechatronics

**T****3.194 Course: Laboratory Solar Energy [T-ETIT-104686]****Responsible:** Dr.-Ing. Klaus Trampert**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Examination of another type**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 24/25	2313716	<a href="#">Laboratory Solar Energy</a>	4 SWS	Practical course / 	Richards, Trampert, Paetzold
ST 2025	2313708	<a href="#">Laboratory Solar Energy</a>	4 SWS	Practical course / 	Trampert, Paetzold, Richards
Exams					
WT 24/25	7313708	<a href="#">Laboratory Solar Energy</a>			Trampert, Richards

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Prerequisites**

none

**3.195 Course: Laser in Automotive Engineering [T-MACH-105164]**

**Responsible:** Dr.-Ing. Johannes Schneider  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	3

Events					
ST 2025	2182642	<a href="#">Laser Material Processing</a>	2 SWS	Lecture /	Schneider
Exams					
WT 24/25	76-T-MACH-105164	<a href="#">Laser in Automotive Engineering</a>			Schneider

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral examination (30 min)

no tools or reference materials

**Prerequisites**

It is not possible, to combine this brick with brick [Laser Material Processing \[T-MACH-112763\]](#), 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.
2. The course [T-MACH-112763 - Laser Material Processing](#) must not have been started.

**Recommendation**

preliminary knowlegde in mathematics, physics and materials science

**Workload**

120 hours

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

**Laser Material Processing**

2182642, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**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-, CO<sub>2</sub>-, high power diode-laser)
- beam properties, guiding and shaping
- basics of materials processing with lasers
- laser applications in material processing
- safety aspects

**The student**

- can explain the principles of light generation, the conditions for light amplification as well as the basic structure and function of Nd:YAG-, CO<sub>2</sub>- and high power diode-laser sources.
- can describe the most important methods of laser-based processing in automotive engineering and illustrate the influence of laser, material and process parameters
- can analyse manufacturing problems and is able to choose a suitable laser source and process parameters.
- can explain the requirements for safe handling of laser radiation and for the design of safe laser systems.

Basic knowledge of physics, chemistry and material science is assumed.

It is not possible, to combine this lecture with the lecture *Physical basics of laser technology* [2181612].

regular attendance: 22,5 hours

self-study: 97,5 hours

oral examination (ca. 30 min)

no tools or reference materials

**Organizational issues**

Die Vorlesung ersetzt die bisherige Vorlesung "Lasereinsatz im Automobilbau" und wird jetzt auf Englisch angeboten!

The lecture replaces the previous lecture "Laser Application in Automotive Engineering" and is now offered in English!

**Literature**

W. T. Silvast: Laser Fundamentals, 2004, Cambridge University Press

J. Eichler, H.-J. Eichler: Laser - Basics, Advances, Applications, 2018, Springer

P. Poprawe: Tailored Light 1, 2018, Springer

K. F. Renk: Basics of Laser Physics, 2017, Springer

M. W. Sigrist: Laser: Theorie, Typen und Anwendungen, 2018, Springer-Spektrum

H. Hügel, T. Graf: Materialbearbeitung mit Laser, 2022, Springer Vieweg

T. Graf: Laser - Grundlagen der Laserstrahlquellen, 2009, Vieweg-Teubner Verlag

R. Poprawe: Lasertechnik für die Fertigung, 2005, Springer





### 3.196 Course: Laser Material Processing [T-MACH-112763]

**Responsible:** Dr.-Ing. Johannes Schneider  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2182642	<a href="#">Laser Material Processing</a>	2 SWS	Lecture /	Schneider
Exams					
WT 24/25	76-T-MACH-112763	<a href="#">Laser Material Processing</a>			Schneider

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

oral examination (30 min)

no tools or reference materials

#### Prerequisites

It is not possible, to combine this brick with Laser in Automotive Engineering [T-MACH-105164], 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.
2. The course [T-MACH-105164 - Laser in Automotive Engineering](#) must not have been started.

#### Recommendation

preliminary knowlegde in mathematics, physics and materials science

#### Workload

120 hours

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



#### Laser Material Processing

2182642, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**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-, CO<sub>2</sub>-, high power diode-laser)
- beam properties, guiding and shaping
- basics of materials processing with lasers
- laser applications in material processing
- safety aspects

**The student**

- can explain the principles of light generation, the conditions for light amplification as well as the basic structure and function of Nd:YAG-, CO<sub>2</sub>- and high power diode-laser sources.
- can describe the most important methods of laser-based processing in automotive engineering and illustrate the influence of laser, material and process parameters
- can analyse manufacturing problems and is able to choose a suitable laser source and process parameters.
- can explain the requirements for safe handling of laser radiation and for the design of safe laser systems.

Basic knowledge of physics, chemistry and material science is assumed.

It is not possible, to combine this lecture with the lecture *Physical basics of laser technology* [2181612].

regular attendance: 22,5 hours

self-study: 97,5 hours

oral examination (ca. 30 min)

no tools or reference materials

**Organizational issues**

Die Vorlesung ersetzt die bisherige Vorlesung "Lasereinsatz im Automobilbau" und wird jetzt auf Englisch angeboten!

The lecture replaces the previous lecture "Laser Application in Automotive Engineering" and is now offered in English!

**Literature**

W. T. Silvast: Laser Fundamentals, 2004, Cambridge University Press

J. Eichler, H.-J. Eichler: Laser - Basics, Advances, Applications, 2018, Springer

P. Poprawe: Tailored Light 1, 2018, Springer

K. F. Renk: Basics of Laser Physics, 2017, Springer

M. W. Sigrist: Laser: Theorie, Typen und Anwendungen, 2018, Springer-Spektrum

H. Hügel, T. Graf: Materialbearbeitung mit Laser, 2022, Springer Vieweg

T. Graf: Laser - Grundlagen der Laserstrahlquellen, 2009, Vieweg-Teubner Verlag

R. Poprawe: Lasertechnik für die Fertigung, 2005, Springer



### 3.197 Course: Leadership and Management Development [T-MACH-105231]

**Responsible:** Andreas Ploch

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	2145184	<a href="#">Leadership and Product Development</a>	2 SWS	Lecture /	Ploch
Exams					
WT 24/25	76-T-MACH-105231	<a href="#">Leadership and Management Development</a>			Ploch

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

oral exam (approx. 20 min)

#### Prerequisites

It is not possible to combine this brick with brick Leadership and Management Development [T-MACH-112585].

#### Workload

120 hours

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



#### Leadership and Product Development

2145184, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

Overview of leadership theories and their application  
 Selected management instruments and their use in organizations  
 Communication and leadership  
 change management  
 Management development and MD programmes  
 Assessment centres and management audits  
 Teamwork, team development and team roles  
 Coaching as an instrument of modern leadership  
 Intercultural competence and cross-cultural leadership  
 Management and ethics, corporate governance  
 Practical exercises and examples to deepen selected contents

#### Organizational issues

Vorlesungsanmeldung und Informationen zur Veranstaltung werden im ILIAS Kurs zur Verfügung gestellt.  
 Weitere Information siehe IPEK-Homepage

#### Literature

Vorlesungsumdruck

**3.198 Course: Liberalised Power Markets [T-WIWI-107043]****Responsible:** Prof. Dr. Wolf Fichtner**Organisation:** KIT Department of Economics and Management**Part of:** [M-MACH-104884 - Courses of the KIT Department of Economics and Management](#)**Type**  
Written examination**Credits**  
5,5**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
2

Events					
WT 24/25	2581998	<a href="#">Liberalised Power Markets</a>	2 SWS	Lecture /	Fichtner
WT 24/25	2581999	<a href="#">Übungen zu Liberalised Power Markets</a>	2 SWS	Practice /	Signer, Fichtner, Beranek
Exams					
WT 24/25	7900160	<a href="#">Liberalised Power Markets NEW</a>			Fichtner

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

The assessment consists of a written exam (60 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment, following §4(2), 3 of the examination regulation).

**Recommendation**

None

**Workload**

165 hours

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

**Liberalised Power Markets**2581998, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**On-Site**

**Content****1. Power markets in the past, now and in future****2. Designing liberalised power markets**

- 2.1. Unbundling Dimensions of liberalised power markets
- 2.2. Central dispatch versus markets without central dispatch
- 2.3. The short-term market model
- 2.4. The long-term market model
- 2.5. Market flaws and market failure
- 2.6. Regulation in liberalised markets

**3. The power (sub)markets**

- 3.1 Day-ahead market
- 3.2 Intraday market
- 3.3 (Long-term) Forwards and futures markets
- 3.4 Emission rights market
- 3.5 Market for ancillary services
- 3.6 The “market” for renewable energies
- 3.7 Future market segments

**4. Grid operation and congestion management**

- 4.1. Grid operation
- 4.2. Congestion management

**5. Market power**

- 5.1. Defining market power
- 5.2. Indicators of market power
- 5.3. Reducing market power

**6. Future market structures in the electricity value chain****1. Power markets in the past, now and in future****2. Designing liberalised power markets**

- 2.2. Unbundling Dimensions of liberalised power markets
- 2.3. Central dispatch versus markets without central dispatch
- 2.4. The short-term market model
- 2.5. The long-term market model
- 2.6. Market flaws and market failure
- 2.7. Regulation in liberalised markets

**3. The power (sub)markets**

- 3.1 Day-ahead market
- 3.2 Intraday market
- 3.3 (Long-term) Forwards and futures markets
- 3.4 Emission rights market
- 3.5 Market for ancillary services
- 3.6 The “market” for renewable energies
- 3.7 Future market segments

**4. Grid operation and congestion management**

- 4.1. Grid operation
- 4.2. Congestion management

**5. Market power**


- 5.1. Defining market power
- 5.2. Indicators of market power
- 5.3. Reducing market power

**6. Future market structures in the electricity value chain****Literature****Weiterführende Literatur:**

Power System Economics; Steven Stoft, IEEE Press/Wiley-Interscience Press, 0-471-15040-1

## T

**3.199 Course: Lighting Engineering [T-ETIT-100772]****Responsible:** Prof. Dr. Cornelius Neumann**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2313739	<a href="#">Lighting Engineering</a>	2 SWS	Lecture / 	Neumann
WT 24/25	2313741	<a href="#">Lighting Engineering (Tutorial to 2313739)</a>	1 SWS	Practice	Neumann
Exams					
WT 24/25	7313739	<a href="#">Lighting Engineering</a>	Neumann		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Prerequisites**

none

## T


**3.200 Course: Lightweight Engineering Design [T-MACH-105221]**





**Responsible:** Prof. Dr.-Ing. Tobias Düser  
Sascha Ott

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	2

Events					
ST 2025	2146190	<a href="#">Lightweight Engineering Design</a>	2 SWS	Lecture / 	Ott
Exams					
WT 24/25	76-T-MACH-105221	<a href="#">Lightweight Engineering Design</a>			Albers, Burkardt
ST 2025	76-T-MACH-105221	<a href="#">Lightweight Engineering Design</a>			Ott, Düser, Albers

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

Written examination (90 min)

### Prerequisites

None

### Workload

120 hours

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

## V

**Lightweight Engineering Design**

2146190, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

### Content

General aspects of lightweight 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.

The students are able to ...

- evaluate the potential of central lightweight strategies and their application in design processes.
- apply different stiffing methods qualitatively and to evaluate their effectiveness.
- evaluate the potential of computer-aided engineering as well as the related limits and influences on manufacturing.
- reflect the basics of lightweight construction from a system view in the context of the product engineering process.

**Organizational issues**

Vorlesungsfolien können über die eLearning-Plattform ILIAS bezogen werden.

Die Prüfungsart wird gemäß der Prüfungsordnung zu Vorlesungsbeginn angekündigt:

- Schriftliche Prüfung: 90 min Prüfungsdauer
- Mündliche Prüfung: 20 min Prüfungsdauer
- Erlaubte Hilfsmittel: keine

Medien: Beamer

Arbeitsbelastung:

- Präsenzzeit: 21 h
- Selbststudium: 99 h

Lecture slides are available via eLearning-Platform ILIAS.

The type of examination (written or oral) will be announced at the beginning of the lecture:

- written examination: 90 min duration
- oral examination: 20 min duration
- auxiliary means: None

Media: Beamer

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****3.201 Course: Liquid Transportation Fuels [T-CIWVT-111095]****Responsible:** Prof. Dr. Reinhard Rauch**Organisation:** KIT Department of Chemical and Process Engineering**Part of:** [M-MACH-105100 - Courses of the KIT Department of Chemical and Process Engineering](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2231130	<a href="#">Liquid Transportation Fuels</a>	2 SWS	Lecture / 	Rauch
WT 24/25	2231131	<a href="#">Exercises on 2231130 Liquid Transportation Fuels</a>	1 SWS	Practice / 	Rauch
Exams					
WT 24/25	7230010	<a href="#">Liquid Transportation Fuels</a>	Rauch		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Learning Control is an oral examination with a duration of about 20 minutes.

**Prerequisites**

None

## T

**3.202 Course: Localization of Mobile Agents [T-INFO-101377]**

**Responsible:** Prof. Dr.-Ing. Uwe Hanebeck  
**Organisation:** KIT Department of Informatics  
**Part of:** [M-MACH-104883 - Courses of the KIT Department of Informatics](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each summer term	2

Events					
ST 2025	24613	<a href="#">Localization of Mobile Agents</a>	3 SWS	Lecture / 🗣️	Hanebeck, Frisch
Exams					
WT 24/25	7500020	<a href="#">Localization of Mobile Agents</a>			Hanebeck
ST 2025	7500004	<a href="#">Localization of Mobile Agents</a>			Hanebeck

Legend: 🖥️ Online, 🔄 Blended (On-Site/Online), 🗣️ On-Site, ✕ Cancelled

**Competence Certificate**

The assessment takes the form of an oral examination, usually lasting 15 minutes in accordance with Section 4 (2) No. 2 of the SPO.

It will be announced six weeks before the examination (§ 6 Para. 3 SPO) whether the performance assessment

- in the form of an oral examination in accordance with § 4 Para. 2 No. 2 SPO **or**
- in the form of a written examination in accordance with § 4 Para. 2 No. 1 SPO

will take place.

**Prerequisites**

None.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-INFO-114169 - Localization of Mobile Agents Pass](#) must have been started.

**Recommendation**

Basic knowledge of linear algebra and stochastics is helpful.

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

## V

**Localization of Mobile Agents**

24613, SS 2025, 3 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
On-Site

**Content**

This module provides a systematic introduction into the topic of localization methods. In order to facilitate understanding, the module is divided into four main topics. Dead reckoning treats the instantaneous determination of a vehicle's position based on dynamic parameters like velocity or steering angle. Localization with the help of measurements of known landmarks is part of static localization. In addition to the closed-form solutions for particular measurements (distances and angles), the least squares method for fusion arbitrary measurements is also introduced. Dynamic localization treats the combination of dead reckoning and static localization. The central part of the lecture is the derivation of the Kalman filter, which has been successfully applied in several practical applications. Finally, simultaneous localization and mapping (SLAM) is introduced, which allows localization in case of (partly) unknown landmark positions.

**Organizational issues**

Prüfungsterminvorschläge und das Verfahren dazu sind auf der Webseite der Vorlesung zu finden.

**Literature**

Grundlegende Kenntnisse der linearen Algebra und Stochastik sind hilfreich.

## T

**3.203 Course: Localization of Mobile Agents Pass [T-INFO-114169]**

**Responsible:** Prof. Dr.-Ing. Uwe Hanebeck  
**Organisation:** KIT Department of Informatics  
**Part of:** [M-MACH-104883 - Courses of the KIT Department of Informatics](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	0	pass/fail	Each summer term	1

**Competence Certificate**

The assessment is carried out in form of course work (German Studienleistung, § 4 Abs. 3 SPO).

The assessment is carried out in digital form. There are ILIAS tests with individual, randomized tasks that can be solved by hand or with a small numerical program. User input is automatically assessed and there is instant feedback. There is no limit on retakes. All tests must be passed; learning progress is displayed in ILIAS.

**Prerequisites**


None.





**Recommendation**

Basic knowledge of linear algebra and stochastics is helpful.

**T****3.204 Course: Logistics and Supply Chain Management [T-MACH-110771]****Responsible:** Prof. Dr.-Ing. Kai Furmans**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	9	Grade to a third	Each summer term	5

Events					
ST 2025	2118078	<a href="#">Logistics and Supply Chain Management</a>	4 SWS	Lecture / 	Furmans, Alicke

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

The success control takes place in the form of an examination performance of a different kind. This is composed as follows:

- 50% assessment of a written examination (60 min) during the semester break
- 50% assessment of an oral examination (20 min) during the semester break

To pass the examination, both examination performances must be passed.

**Prerequisites**

None

**Annotation**

The brick cannot be taken if one of the bricks "T-MACH-102089 – Logistics - Organisation, Design and Control of Logistic Systems" and "T-MACH-105181 – Supply Chain Management" has been taken.

**Workload**

270 hours

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

**V****Logistics and Supply Chain Management**2118078, SS 2025, 4 SWS, Language: English, [Open in study portal](#)**Lecture (V)  
On-Site**

**Content**

In the lecture "Logistics and Supply Chain Management", comprehensive and well-founded fundamentals of crucial issues in logistics and supply chain management are presented. Furthermore, the interaction of different design elements of supply chains is emphasized. For this purpose, both qualitative and quantitative models are presented and applied. Additionally, methods for mapping and evaluating logistics systems and supply chains are described. The contents of the lecture are deepened in exercises and case studies and comprehension is partially reviewed in case studies. The contents will be illustrated, among other things, on the basis of supply chains in the automotive industry.

Among others, the following topics are covered:

- Inventory Management
- Forecasting
- Bullwhip Effect
- Supply Chain Segmentation and Collaboration
- Key Performance Indicators
- Supply Chain Risk Management
- Production Logistics
- Location Planning
- Route Planning

It is intended to provide an interactive format in which students can also contribute (and work alone or in groups). Since logistics and supply chain management requires working in an international environment and therefore many terms are derived from English, the lecture will be held in English.

Plenary: The plenary sessions take place on Mondays from 09:45 - 13:00 and from 14:00 - 17:15.

Exercises: There are a total of five exercise sessions, which take place on Thursdays from 14:00 to 15:30. The dates can be found in the schedule in Ilias.

Examination dates: This is a "Prüfungsleistung anderer Art", consisting of a written and an oral part. The written exam is planned on 14th August 2024 from 8:00 am to 9:00 am. The oral examinations are expected to take place the two weeks before, i.e. in calendar weeks 31 and 32. An oral examination lasts 20 minutes.





Contact person: In the summer semester 2024, the contact persons for organisational matters are Maximilian Barlang and Alexander Ernst. Please contact us at [log-scm@ifl.kit.edu](mailto:log-scm@ifl.kit.edu)

## T

**3.205 Course: Logistics and Supply Chain Management [T-WIWI-102870]****Responsible:** Prof. Dr. Frank Schultmann**Organisation:** KIT Department of Economics and Management**Part of:** [M-MACH-104884 - Courses of the KIT Department of Economics and Management](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	3,5	Grade to a third	Each summer term	2

Events					
ST 2025	2581996	<a href="#">Logistics and Supply Chain Management</a>	2 SWS	Lecture / 	Schultmann, Rosenberg
Exams					
WT 24/25	7981996	<a href="#">Logistics and Supply Chain Management</a>	Schultmann		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

The assessment consists of an oral (30 minutes) or written exam (60 minutes) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

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

## V

**Logistics and Supply Chain Management**2581996, SS 2025, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

Students are introduced to the methods and tools of logistics and supply chain management. They students learn the key terms and components of supply chains together with key economic trade-offs. In detail, students gain knowledge of decisions in supply chain management, such as facility location, supply chain planning, inventory management, pricing and supply chain cooperation. In this manner, students will gain knowledge in analyzing, designing and steering of decisions in the domain of logistics and supply chain management.

- Introduction: Basic terms and concepts
- Facility location and network optimization
- Supply chain planning I: flexibility
- Supply chain planning II: forecasting
- Inventory management & pricing
- Supply chain coordination I: the Bullwhip-effect
- Supply chain coordination II: double marginalization
- Supply chain risk management

**Literature**

Wird in der Veranstaltung bekannt gegeben.

**3.206 Course: Machine Dynamics [T-MACH-105210]**

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

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each summer term	1

Events					
WT 24/25	2161224	<a href="#">Machine Dynamics</a>	2 SWS	Lecture /	Proppe
ST 2025	2161224	<a href="#">Machine Dynamics</a>	2 SWS	Lecture /	Proppe
ST 2025	2161225	<a href="#">Machine Dynamics (Tutorial)</a>	1 SWS	Practice /	Proppe, Fischer
Exams					
WT 24/25	76-T-MACH-105210	<a href="#">Machine Dynamics</a>	Proppe		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

written exam, 180 min.

**Prerequisites**

none

**Workload**

150 hours

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

**Machine Dynamics**

2161224, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
Online

**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

**Literature**

Biezeno, Grammel: Technische Dynamik, 2. Aufl., 1953

Holzweißig, Dresig: Lehrbuch der Maschinendynamik, 1979

Dresig, Vulfson: Dynamik der Mechanismen, 1989

**Machine Dynamics**

2161224, SS 2025, 2 SWS, Language: German/English, [Open in study portal](#)

**Lecture (V)**  
On-Site

**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

**Literature**

Biezeno, Grammel: Technische Dynamik, 2. Aufl., 1953

Holzweißig, Dresig: Lehrbuch der Maschinendynamik, 1979

Dresig, Vulfson: Dynamik der Mechanismen, 1989

**Machine Dynamics (Tutorial)**

2161225, SS 2025, 1 SWS, Language: English, [Open in study portal](#)

**Practice (Ü)  
On-Site**

**Content**

Exercises related to the lecture



**3.207 Course: Machine Dynamics II [T-MACH-105224]**

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

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

Events					
WT 24/25	2162220	<a href="#">Machine Dynamics II</a>	2 SWS	Lecture /	Proppe
ST 2025	2162220	<a href="#">Machine Dynamics II</a>	2 SWS	Lecture /	Proppe
Exams					
WT 24/25	76-T-MACH-105224	<a href="#">Machine Dynamics II</a>	Proppe		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**  
 oral exam, 20 min.

**Prerequisites**  
 none

**Recommendation**  
 Machine Dynamics

**Workload**  
 120 hours

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

**Machine Dynamics II**

2162220, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**Online**

**Content**

hydrodynamic bearings

- rotating shafts in hydrodynamic bearings
- belt drives
- vibration of turbine blades

**Organizational issues**

Die Vorlesung wird ausschließlich online angeboten.

**Literature**

R. Gasch, R. Nordmann, H. Pfützner: Rotordynamik, Springer, 2006

**Machine Dynamics II**

2162220, SS 2025, 2 SWS, Language: German/English, [Open in study portal](#)

**Lecture (V)**  
**Online**

**Content**

Students are able to develop and analyze detailed models in machine dynamics that encompass continuum models, fluid structure interaction, and stability analyses.

hydrodynamic bearings

- rotating shafts in hydrodynamic bearings
- belt drives
- vibration of turbine blades


**Organizational issues**





Für diese Vorlesung werden online Unterlagen bereitgestellt.

**Literature**

R. Gasch, R. Nordmann, H. Pfützner: Rotordynamik, Springer, 2006

**T****3.208 Course: Machine Tools and High-Precision Manufacturing Systems [T-MACH-110962]****Responsible:** Prof. Dr.-Ing. Jürgen Fleischer**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
8**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2149910	<a href="#">Machine Tools and High-Precision Manufacturing Systems</a>	6 SWS	Lecture / Practice ( /  )	Fleischer
Exams					
WT 24/25	76-T-MACH-110962	<a href="#">Machine Tools and High-Precision Manufacturing Systems</a>	Fleischer		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral exam (40 minutes)

**Prerequisites**

T-MACH-102158 - Machine Tools and Industrial Handling must not be commenced.

T-MACH-109055 - Machine Tools and Industrial Handling must not be commenced.

T-MACH-110963 - Machine Tools and High-Precision Manufacturing Systems must not be commenced.

**Workload**

240 hours

*Below you will find excerpts from events related to this course:***V****Machine Tools and High-Precision Manufacturing Systems**2149910, WS 24/25, 6 SWS, Language: German, [Open in study portal](#)**Lecture / Practice (VÜ)  
On-Site**

**Content**

The lecture gives an overview of the construction, use and application of machine tools and high-precision manufacturing systems. In the course of the lecture a well-founded and practice-oriented knowledge for the selection, design and evaluation of machine tools and high-precision manufacturing systems is conveyed. First, the main components of the systems are systematically explained and their design principles as well as the integral system design are discussed. Subsequently, the use and application of machine tools and high-precision manufacturing systems 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 and artificial intelligence.

Guest lectures from industry round off the lecture with insights into practice.

The individual topics are:

- Structural components of dynamic manufacturing Systems
- Feed axes: High-precision positioning
- Spindles of cutting machine Tools
- Peripheral Equipment
- Machine control unit
- Metrological Evaluation
- Maintenance strategies and condition Monitoring
- Process Monitoring
- Development process for machine tools and high-precision manufacturing Systems
- Machine examples

**Learning Outcomes:**

The students ...

- are able to assess the use and application of machine tools and high-precision manufacturing systems and to differentiate between them in terms of their characteristics and design.
- can describe and discuss the essential elements of machine tools and high-precision manufacturing systems (frame, main spindle, feed axes, peripheral equipment, control unit).
- are able to select and dimension the essential components of machine tools and high-precision manufacturing systems.
- are capable of selecting and evaluating machine tools and high-precision manufacturing systems according to technical and economic criteria.

**Workload:****MACH:**

regular attendance: 63 hours

self-study: 177 hours

**WING/TVWL:**

regular attendance: 63 hours

self-study: 207 hours

**Organizational issues**

Vorlesungstermine montags und mittwochs, Übungstermine donnerstags.

Bekanntgabe der konkreten Übungstermine erfolgt in der ersten Vorlesung.

Lectures on Mondays and Wednesdays, tutorial on Thursdays.

The tutorial dates will announced in the first lecture.

Zur Vertiefung des im Rahmen der Lehrveranstaltung erworbenen Wissens werden die theoretischen Vorlesungseinheiten durch Praxiseinheiten im Umfeld der Karlsruher Forschungsfabrik (<https://www.karlsruher-forschungsfabrik.de>) unterstützt.

The theoretical lectures are complemented by practical lectures in the Karlsruhe Research Factory (<https://www.karlsruher-forschungsfabrik.de/en.html>) to deepen the acquired knowledge.

**Literature****Medien:**

Skript zur Veranstaltung wird über Ilias (<https://ilias.studium.kit.edu/>) bereitgestellt.

**Media:**

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



### 3.209 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Written examination





**Credits**  
8

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	2137308	<a href="#">Machine Vision</a>	4 SWS	Lecture / Practice ( /  )	Lauer, Merkert
Exams					
WT 24/25	76-T-MACH-105223	<a href="#">Machine Vision</a>	Stiller, Lauer		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

#### Competence Certificate

Type of Examination: written exam

Duration of Examination: 60 minutes

#### Prerequisites

None

#### Workload

240 hours

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



#### Machine Vision

2137308, WS 24/25, 4 SWS, Language: English, [Open in study portal](#)

**Lecture / Practice (VÜ)  
On-Site**

#### Content

Lernziele (EN):

*Machine vision (or computer vision)* describes all kind of techniques that can be used to extract information from camera images in an automated way. Considerable improvements of machine vision techniques throughout recent years, e.g. by the advent of deep learning, have caused growing interest in these techniques and enabled applications in various domains, e.g. robotics, autonomous driving, gaming, production control, visual inspection, medicine, surveillance systems, and augmented reality.

The participants should gain an overview over the basic techniques in machine vision and obtain hands-on experience.

Nachweis: written exam, 60 min.

Arbeitsaufwand: 240 hours

Voraussetzungen: none

#### Literature

Foliensatz zur Veranstaltung wird als kostenlose pdf-Datei bereitgestellt. Weitere Empfehlungen werden in der Vorlesung bekannt gegeben.

## T

**3.210 Course: Machines and Processes [T-MACH-105208]**

**Responsible:** Prof. Dr.-Ing. Hans-Jörg Bauer  
 Prof. Dr. Thomas Koch  
 Dr.-Ing. Heiko Kubach  
 Dr. Balazs Pritz

**Organisation:** KIT Department of Mechanical Engineering

Institute of Thermal Turbomachinery

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)



**Type**  
Written examination





**Credits**  
7

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
2

Events					
WT 24/25	2185000	<a href="#">Machines and Processes</a>	4 SWS	Lecture / Practice ( /  )	Bauer, Pritz, Koch
ST 2025	3134140	<a href="#">Machines and Processes</a>	4 SWS	Lecture / Practice ( /  )	Bauer, Maas, Kubach, Pritz, Bykov
Exams					
WT 24/25	76-T-MACH-105208e-NEW	<a href="#">Machines and Processes, new Version as of WS 23/24 (exam in English language)</a>			Bauer, Koch
WT 24/25	76-T-MACH-105208-NEU	<a href="#">Machines and Processes, new Version as of WS 23/24 (Exam in German Language)</a>			Bauer, Koch

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### 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.

### Workload

210 hours

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

## V

**Machines and Processes**

2185000, WS 24/25, 4 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)**  
**On-Site**

**Content**

- Introduction to power engineering
- Radial and axial turbines
- Pumps
- Compressors
- Blowers
- Wind turbines
- Fuel cells
- Energy storage
- E-motors
- Heat pumps
- Combined heat and power
- Diesel engines
- Gasoline engines
- Hydrogen engines

## T

**3.211 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

Institute of Thermal Turbomachinery

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Completed coursework

**Credits**  
0

**Grading scale**  
pass/fail

**Recurrence**  
Each term

**Version**  
1

Events					
WT 24/25	2187000	<a href="#">Machines and Processes</a>	1 SWS	Practical course /	Bauer, Kubach, Pritz, Schmidt, Bykov
ST 2025	2187000	<a href="#">Machines and Processes (Lab Course)</a>	1 SWS	Practical course /	Bauer, Kubach, Maas, Pritz, Bykov
Exams					
WT 24/25	76-T-MACH-105232	<a href="#">Machines and Processes, Prerequisite</a>			Kubach, Maas, Bauer, Pritz

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

successful completed training course

**Prerequisites**

none

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

## V

**Machines and Processes**

2187000, WS 24/25, 1 SWS, [Open in study portal](#)

**Practical course (P)**  
On-Site

**Content**

Lab Course Experiment

## V

**Machines and Processes (Lab Course)**

2187000, SS 2025, 1 SWS, Language: German, [Open in study portal](#)

**Practical course (P)**  
On-Site



**Content**

successful lab course and written exam (2 h)

Taking part at the exam is possible only when lab course has been successfully completed

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.

**Media:**

slides to download

Documentation of the labcourse

basics of thermodynamics

thermal fluid machines

- steam turbines
- gas turbines
- combined-cycle plants
- turbines and compressors
- aircraft engines

hydraulic fluid machines

- operating performance
- characterization
- control
- cavitation
- wind turbines, propellers

internal combustion engines

- characteristic parameters
- engine parts
- kinematics
- engine processes
- emissions

regular attendance: 48 h, self-study: 160 h

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.

T

**3.212 Course: Magnet Technology of Fusion Reactors [T-MACH-105434]**

**Responsible:** Dr. Klaus-Peter Weiss  
Dr. Michael Wolf

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Oral examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each summer term

**Version**  
1

Events					
ST 2025	2190496	<a href="#">Magnet Technology of Fusion Reactors</a>	2 SWS	Lecture / 	Weiss, Wolf
Exams					
WT 24/25	76-T-MACH-105434	<a href="#">Magnet Technology of Fusion Reactors</a>			Weiss
ST 2025	76-T-MACH-105434	<a href="#">Magnet Technology of Fusion Reactors</a>			Weiss

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Oral examination of about 30 minutes

**Prerequisites**

none

**Annotation**

none

**Workload**

120 hours

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

V

**Magnet Technology of Fusion Reactors**

2190496, SS 2025, 2 SWS, Language: German/English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

In Greifswald/Germany the fusion experiment Wendelstein 7-X is now in operation to demonstrate the performance of Stellerator-type fusion machines. In south of France the fusion reactor ITER is under construction which will demonstrate the production of energy by fusion. In both machines the plasma inclusion will be ensured by magnets and to produce high magnetic fields in an efficient way, these magnets have to be superconducting. Design, construction and operation of such magnets is a technologic challenge because low temperature (4.5 K) and high currents (typ. 68 kA) are necessary.

The lecture will show basic principles for design and construction of such magnets and includes:

- Introduction with examples to nuclear fusion and to magnetic plasma confinement
- Basics of low temperature and high temperature properties and cryotechnique
- Material testing and critical material properties at low temperatures
- Principles of magnet design, construction and safe magnet operation
- Present status and magnet examples from fusion projects ITER, W7-X and JT-60SA
- Application of high temperature superconductors on fusion and power engineering

The goal of the lecture is to impart the fundamentals of construction of superconducting magnets. Magnet technology is inherently of multidisciplinary character e.g. material properties at low temperature, high voltage and high current technique. The use of superconductors is mandatory to reach highest magnetic fields with comparable small losses. Examples of magnets from power application, basic research and fusion reactor construction are discussed.

**Lecture Content:**

- Basics of nuclear fusion and design aspects of fusion magnets
- Superconductors - basics and stability
- Low temperature cryogenic aspects
- Low temperature and high temperature superconductors
- Cryogenic material testing and properties of fusion materials at low temperatures
- Quench and high voltage aspects for magnets
- Status and magnets of fusion machines ITER, W7-X, JT-60SA & future DEMO
- Impact of high temperature superconductors on fusion and power engineering

Educational objective: The students know:

- Magnetic plasma confinement principles in connection with fusion machine
- Examples and basic properties of different superconductors
- Basics of formation of superconducting cables and magnet construction
- Generation of low temperature, cryostat construction
- Basics of magnet design and magnet safety
- Material testing and material properties at low temperatures
- High-temperature superconductor use in magnet construction and power application

**Recommendations:**

Knowledge in energy technology, power plants, material testing is welcomed

- Time of attendance: 2 SWS, Other: excursion, etc. 5 hours
- Self-study: preparation and postprocessing LV (course): 1 hour / week
- Preparation for the examination: 80 hours per semester

Oral examination of about 30 minutes



### 3.213 Course: Magnetohydrodynamics [T-MACH-105426]

**Responsible:** apl. Prof. Dr. Leo Bühler

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2153429	<a href="#">Magnetohydrodynamics</a>	2 SWS	Lecture /	Bühler
Exams					
WT 24/25	76-T-MACH-105426	<a href="#">Magnetohydrodynamics</a>			Bühler

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

oral

Duration: 30 minutes

No auxiliary means

#### Prerequisites

The partial performance number T-MACH-108845 "Magnetohydrodynamics" (Nat/Inf/Etit) must not be started or completed.

The partial services T-MACH-108845 "Magnetohydrodynamics" (Nat/Inf/Etit) and T-MACH-105426 "Magnetohydrodynamics" are mutually exclusive.

#### Recommendation

Fluid Mechanics (T-MACH-105207)

Mathematical Methods in Fluid Mechanics (T-MACH-105295)

#### Workload

120 hours

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



### Magnetohydrodynamics

2153429, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

- Introduction
- Basics of electro and fluid dynamics
- Exact solutions, Hartmann flow, pump, generator, channel flows
- Inductionless approximation
- Developing flows, change of cross-section, variable magnetic fields
- Alfvén waves
- Stability, transition to turbulence
- Liquid dynamos

Educational objective: The students can describe the fundamentals of magnetohydrodynamics. They are qualified to explain the interrelations of electro and fluid dynamics so as to analyze magnetohydrodynamic flows in engineering applications or for phenomena in geo and astrophysics.

#### Literature

U. Müller, L. Bühler, 2001, Magnetofluidynamics in Channels and Containers, ISBN 3-540-41253-0, Springer Verlag

R. Moreau, 1990, Magnetohydrodynamics, Kluwer Academic Publisher

P. A. Davidson, 2001, An Introduction to Magnetohydrodynamics, Cambridge University Press




J. A. Shercliff, 1965, A Textbook of Magnetohydrodynamics, Pergamon Press





## T

## 3.214 Course: Management Accounting 1 [T-WIWI-102800]

**Responsible:** Prof. Dr. Marcus Wouters**Organisation:** KIT Department of Economics and Management**Part of:** [M-MACH-104884 - Courses of the KIT Department of Economics and Management](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4,5	Grade to a third	Each summer term	2

Events					
ST 2025	2579900	<a href="#">Management Accounting 1</a>	2 SWS	Lecture / 	Wouters
ST 2025	2579901	<a href="#">Tutorial Management Accounting 1 (Bachelor)</a>	2 SWS	Practice / 	Dickemann
ST 2025	2579902	<a href="#">Tutorial Management Accounting 1 (Master)</a>	2 SWS	Practice / 	Dickemann
Exams					
WT 24/25	79-2579900-B	<a href="#">Management Accounting 1 (Bachelor)</a>			Wouters
WT 24/25	79-2579900-M	<a href="#">Management Accounting 1 (Mastervorzug und Master)</a>			Wouters

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

The assessment consists of a written exam (120 min.) according to § 4 paragraph 2 Nr. 1 of the examination regulation.

**Recommendation**

We recommend that you take part in our exercise for the lecture.

**Annotation**

The exercise is offered separately for Bachelor's students as well as for students in the Master's transfer and Master's program.

Note for exam registration:

- Bachelor students: 79-2579900-B Management Accounting 1 (Bachelor)
- Students in the Master's transfer and Master's program: 79-2579900-M Management Accounting 1 (Master's transfer and Master)

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

## V

## Management Accounting 1

2579900, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**Online**

**Content**

The course covers topics in management accounting in a decision-making framework. Some of these topics in the course MA1 are: short-term planning, investment decisions, budgeting and activity-based costing.

We will use international material written in English.

We will approach these topics primarily from the perspective of the users of financial information (not so much from the controller who prepares the information).

The course builds on an introductory level of understanding of accounting concepts from Business Administration courses in the core program. The course is intended for students in Industrial Engineering.

**Learning objectives:**

- Students have an understanding of theory and applications of management accounting topics.
- They can use financial information for various purposes in organizations.

**Examination:**

- The assessment consists of a written exam (120 minutes) at the end of each semester (following § 4 (2) No. 1 of the examination regulation).

**Workload:**

- The total workload for this course is approximately 135.0 hours. For further information see German version.

**Literature**

- Marc Wouters, Frank H. Selto, Ronald W. Hilton, Michael W. Maher: Cost Management – Strategies for Business Decisions, 2012, Publisher: McGraw-Hill Higher Education (ISBN-13 9780077132392 / ISBN-10 0077132394)
- In addition, several papers that will be available on ILIAS.

**Tutorial Management Accounting 1 (Bachelor)**

2579901, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Practice (Ü)  
On-Site**

**Content**

see Module Handbook

**Tutorial Management Accounting 1 (Master)**

2579902, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Practice (Ü)  
On-Site**


**Content**





see Module Handbook

**T****3.215 Course: Management and Strategy [T-WIWI-102629]**

**Responsible:** Prof. Dr. Hagen Lindstädt  
**Organisation:** KIT Department of Economics and Management  
**Part of:** [M-MACH-104884 - Courses of the KIT Department of Economics and Management](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	3,5	Grade to a third	Each summer term	2

Events					
ST 2025	2577900	<a href="#">Strategic Management</a>	2 SWS	Lecture / 	Lindstädt
Exams					
WT 24/25	7900199	<a href="#">Strategic Management</a>			Lindstädt
ST 2025	7900067	<a href="#">Strategic Management</a>			Lindstädt

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

The assessment consists of a written exam (60 min) taking place at the beginn of the recess period (according to §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****Strategic Management**

2577900, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
On-Site

**Content**

Students learn central concepts of strategic management along the ideal-typical strategy process. An overview of fundamental frameworks and models will be provided and an action-oriented integration performance will be achieved through the transfer of theory to practical issues.

Through intensive exposure to real-world case studies, students will be encouraged to learn and apply strategic measures in a targeted manner in the real business world. The course features an action-oriented approach and provides students with a realistic understanding of the possibilities and limitations of rational design approaches.

Content in Keywords:

- Corporate governance and strategic management: concepts, levels, process.
- Strategic analysis: internal and external analysis
- Competitive strategy: formulation, evaluation and selection of strategic action alternatives at business unit level
- Strategic interaction and strategic commitment
- Corporate strategy: diversification strategy, M&A and management of the corporate portfolio
- Implementation of strategies in companies

**Structure:**

Lectures in the course are available to students online as recordings, while class dates are reserved for active discussion of real-world case studies.

**Learning Objectives:**

Upon completion of the course, students will be able to,

- Prepare strategic decisions along the ideal strategic process in a practical setting,
- Identify sources of competitive advantage,
- Explain interrelationships of companies in competition,
- Evaluate the portfolio management of companies,
- To classify actions and decisions of companies strategically,
- Apply knowledge from theoretical frameworks to the analysis of real-life situations.

**Recommendations:**

None.

**Workload:**

Total workload for 3.5 credit hours: approximately 105 hours.

Attendance: 30 hours

Self-study: 75 hours

**Verification:**

Depending on further pandemic developments, the examination will be offered in the summer semester 2021 either as an open-book examination (examination performance of another kind according to SPO § 4 Abs. 2, Pkt. 3), or as a 60-minute written examination (written examination according to SPO § 4 Abs. 2, Pkt. 1).

It is expected that the exam will take place at the beginning of the semester's lecture-free period.

The examination is offered every semester and can be repeated at any regular examination date.

**Literature**

- Pidun, U.: *Corporate Strategy: Theory and Practice*. Springer-Gabler, Wiesbaden 2019.
- Lindstädt, H.; Hauser, R.: *Strategische Wirkungsbereiche des Unternehmens*. Gabler, Wiesbaden 2004.
- Grant, R.M.: *Contemporary Strategy Analysis*, 10. Aufl., Wiley 2018.

Die relevanten Auszüge und zusätzliche Quellen werden in der Veranstaltung bekannt gegeben.



**T****3.216 Course: Manufacturing Technology [T-MACH-102105]**

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

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Written examination





**Credits**  
8

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
3

Events					
WT 24/25	2149657	<a href="#">Manufacturing Technology</a>	6 SWS	Lecture / Practice ( /  )	Schulze
Exams					
WT 24/25	76-T-MACH-102105	<a href="#">Manufacturing Technology</a>	Schulze		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Written Exam (180 min)

**Prerequisites**

none

**Workload**

240 hours

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

**V****Manufacturing Technology**

2149657, WS 24/25, 6 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)**  
**Blended (On-Site/Online)**

**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 lecture provides an excursion to an industry company.

**Learning Outcomes:**

The students ...

- are capable to specify the different manufacturing processes and to explain their functions.
- are able to classify the manufacturing processes by their general structure and functionality according to the specific main groups.
- have the ability to perform a process selection based on their specific characteristics.
- are enabled to identify correlations between different processes and to select a process regarding possible applications.
- are qualified to evaluate different processes regarding specific applications based on technical and economic aspects.
- are experienced to classify manufacturing processes in a process chain and to evaluate their specific influence on surface integrity of workpieces regarding the entire process chain.

**Workload:**

regular attendance: 63 hours

self-study: 177 hours

**Organizational issues**

Vorlesungstermine montags und dienstags, Übungstermine mittwochs.

Bekanntgabe der konkreten Übungstermine erfolgt in der ersten Vorlesung.

Die LV wird letztmalig im WS 2024/25 angeboten (Vorlesungsvideos bleiben online).

Die Prüfung wird für Erstschrreiber letztmalig im SS 2025 und Wiederholer letztmalig im WS 2025/26 angeboten.

**Literature****Medien:**

Skript zur Veranstaltung wird über ilias (<https://ilias.studium.kit.edu/>) bereitgestellt.

**Media:**

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

## T

**3.217 Course: Materials Characterization [T-MACH-110946]**

**Responsible:** Dr.-Ing. Jens Gibmeier  
Prof. Dr. Reinhard Schneider

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

Events					
WT 24/25	2173431	<a href="#">Materials Characterization</a>	2 SWS	Lecture / 🗣️	Gibmeier, Peterlechner
Exams					
WT 24/25	76-T-MACH-110946	<a href="#">Materials Characterization</a>			Gibmeier
ST 2025	76-T-MACH-110946	<a href="#">Materials Characterization</a>			Gibmeier

Legend: 🖥️ Online, 🔄 Blended (On-Site/Online), 🗣️ On-Site, ✕ Cancelled

**Competence Certificate**

Oral exam, about 25 minutes

**Prerequisites**

Successful participation in Exercises for Materials Characterization is the condition for the admittance to the oral exam in Materials Characterization.

T-MACH-107685 – Übungen zu Werkstoffanalytik has not been started.

T-MACH-107684 – Werkstoffanalytik has not been started.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-110945 - Exercises for Materials Characterization](#) must have been passed.
2. The course [T-MACH-107685 - Exercises for Materials Characterization](#) must not have been started.
3. The course [T-MACH-107684 - Materials Characterization](#) must not have been started.

**Workload**

120 hours

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

## V

**Materials Characterization**

2173431, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

The following methods will be introduced within this lecture:

- microscopic methods: optical microscopy, electron microscopy (SEM/TEM), atomic force microscopy
- material and microstructure analyses by means of X-ray, neutron and electron beams
- analysis methods at SEM/TEM (e.g. EELS)
- spectroscopic methods (e.g. EDS / WDS)

**learning objectives:**

The students have fundamental knowledge about methods of material analysis. They have a basic understanding to transfer this fundamental knowledge on problems in engineering science. Furthermore, the students have the ability to describe technical material by its microscopic and submicroscopic structure.

**Organizational issues**

Start am 22.10.2024

**Literature**

Vorlesungsskript (wird zu Beginn der Veranstaltung ausgegeben).

Literatur wird zu Beginn der Veranstaltung bekanntgegeben.

## T


**3.218 Course: Materials Characterization [T-MACH-107684]**





**Responsible:** Dr.-Ing. Jens Gibmeier  
Prof. Dr. Reinhard Schneider

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	4

Events					
ST 2025	2174586	<a href="#">Materials Characterization</a>	2 SWS	Lecture / 	Gibmeier, Peterlechner
Exams					
WT 24/25	76-T-MACH-107684	<a href="#">Materials Characterization</a>			Gibmeier
ST 2025	76-T-MACH-107684	<a href="#">Materials Characterization</a>			Gibmeier

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Oral exam, about 25 minutes

**Prerequisites**

Successful participation in Übungen zu Werkstoffanalytik is the condition for the admittance to the oral exam in Werkstoffanalytik.

T-MACH-110945 – Exercises for Materials Characterization has not been started.

T-MACH-110946 – Materials Characterization has not been started.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-107685 - Exercises for Materials Characterization](#) must have been passed.
2. The course [T-MACH-110945 - Exercises for Materials Characterization](#) must not have been started.
3. The course [T-MACH-110946 - Materials Characterization](#) must not have been started.

**Workload**

120 hours

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

## V

**Materials Characterization**

2174586, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

The following methods will be introduced within this lecture:

- microscopic methods: optical microscopy, electron microscopy (SEM/TEM), atomic force microscopy
- material and microstructure analyses by means of X-ray, neutron and electron beams
- analysis methods at SEM/TEM (e.g. EELS)
- spectroscopic methods (e.g. EDS / WDS)

**learning objectives:**

The students have fundamental knowledge about methods of material analysis. They have a basic understanding to transfer this fundamental knowledge on problems in engineering science. Furthermore, the students have the ability to describe technical material by its microscopic and submicroscopic structure.


**Literature**





Vorlesungsskript (wird zu Beginn der Veranstaltung ausgegeben).

Literatur wird zu Beginn der Veranstaltung bekanntgegeben.

## T

**3.219 Course: Materials Modelling: Dislocation Based Plasticity [T-MACH-105369]****Responsible:** Dr. Daniel Weygand**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
2

Events					
ST 2025	2182740	<a href="#">Materials modelling: dislocation based plasticity</a>	2 SWS	Lecture / 	Weygand
Exams					
WT 24/25	76-T-MACH-105369	<a href="#">Materials Modelling: Dislocation Based Plasticity</a>			Weygand

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam ca. 30 minutes

**Prerequisites**

none

**Recommendation**

preliminary knowlegde in mathematics, physics and materials science

**Workload**

120 hours

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

## V

**Materials modelling: dislocation based plasticity**2182740, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

1. Introduction
2. elastic fields of dislocations
3. slip, crystallography
4. equations of motion of dislocations
  - a) fcc
  - b) bcc
5. interaction between dislocations
6. molecular dynamics
7. discrete dislocation dynamics
8. continuum description of dislocations

**The student**

- has the basic understanding of the physical basics to describe dislocations and their interaction with point, line and area defects.
- can apply modelling approaches for dislocation based plasticity.
- can explain discrete methods for modelling of microstructural evolution processes.

preliminary knowlegde in mathematics, physics and materials science recommended

regular attendance: 22,5 hours

self-study: 97,5 hours


oral exam ca. 30 minutes





**Literature**

1. D. Hull and D.J. Bacon, Introduction to Dislocations, Oxford Pergamon 1994
2. W. Cai and W. Nix, Imperfections in Crystalline Solids, Cambridge University Press, 2016
3. J.P. Hirth and J. Lothe: Theory of dislocations, New York Wiley 1982. (oder 1968)
4. J. Friedel, Dislocations, Pergamon Oxford 1964.
5. V. Bulatov, W. Cai, Computer Simulations of Dislocations, Oxford University Press 2006
6. A.S. Argon, Strengthening mechanisms in crystal plasticity, Oxford materials.

## T

**3.220 Course: Materials of Lightweight Construction [T-MACH-105211]****Responsible:** Dr.-Ing. Wilfried Liebig**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
2

Events					
ST 2025	2174574	<a href="#">Materials of Lightweight Construction</a>	2 SWS	Lecture / 	Liebig
Exams					
WT 24/25	76-T-MACH-105211	<a href="#">Materials of Lightweight Construction</a>			Liebig
ST 2025	76-T-MACH-105211	<a href="#">Materials of Lightweight Construction</a>			Liebig

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral exam, about 25 minutes

**Prerequisites**

T-MACH-114012 must not have been started.

**Recommendation**

Materials Science I/II

**Workload**

120 hours

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

## V

**Materials of Lightweight Construction**2174574, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site**

**Content**

Introduction

Constructive, production-oriented 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

**learning objectives:**

The students are capable to name different lightweight materials and can describe their composition, properties and fields of application. They can describe the hardening mechanisms of lightweight materials and can transfer this knowledge to applied problems.

The students can apply basic mechanical models of composites and can depict differences in the mechanical properties depending on composition and structure. The students can describe the basic principle of hybrid material concepts and can judge their advantages in comparison to bulk materials. The students can name special materials for lightweight design and depict differences to conventional materials. The students have the ability to present applications for different lightweight materials and can balance reasons for their use.

**requirements:**

Werkstoffkunde I/II (recommended)

**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).

**Examination:**

Oral examination, Duration approx. 25 min

**Literature**

Literaturhinweise, Unterlagen und Teilmanuskript in der Vorlesung



## T

**3.221 Course: Materials Physics and Metals [T-MACH-100285]**

**Responsible:** Prof. Dr.-Ing. Martin Heilmaier  
Prof. Dr. Astrid Pundt

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	13	Grade to a third	Each winter term	2

Events					
WT 24/25	2177010	<a href="#">Materials Physics</a>	3 SWS	Lecture /	Gruber
ST 2025	2174598	<a href="#">Metals</a>	4 SWS	Lecture /	Pundt, Wagner
ST 2025	2174599	<a href="#">Exercises in Metals</a>	1 SWS	Practice /	Wagner
Exams					
WT 24/25	76-T-MACH-100285	<a href="#">Materials Physics and Metals</a>	Gruber, Pundt		
WT 24/25	76-T-MACH-100285-W	<a href="#">Materials Physics and Metals</a>	Gruber, Pundt		
ST 2025	76-T-MACH-100285	<a href="#">Materials Physics and Metals</a>	Pundt, Gruber, Wagner		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Oral exam, about 45 minutes

**Prerequisites**

none

**Workload**

390 hours

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

## V

**Metals**

2174598, SS 2025, 4 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

Properties of pure elements; thermodynamic foundations of single-component and of binary systems, as well as multiphase systems; nucleation and growth; diffusion processes in crystalline materials; phase diagrams; effects of alloying; nonequilibrium microstructures; heat treatment technology

**learning objectives:**

The students are familiar with the thermodynamic foundations of phase transformations, the kinetics of phase transformations in the solid state, the mechanisms of microstructure formation and microstructure-property relationships and can apply them to metallic materials. They can assess the effects of heat treatments and of alloying on the microstructure and the mechanical and physical properties of metallic materials. This competence is in particular deepened for iron- and aluminum-based alloys.

**requirements:**

Materials physics

**workload:**

Regular attendance: 42 h

Self-study: 138 h

**Organizational issues**

Weitere Informationen zu dieser Veranstaltung finden Sie hier: <https://www.iam.kit.edu/wk/lehre.php>

**Literature**

D.A. Porter, K. Easterling, Phase Transformation in Metals and Alloys, 2nd edition, Chapman & Hall, London 1997,  
 G. Gottstein. Physikalische Grundlagen der Materialkunde, Springer 2007  
 E. Hornbogen, H. Warlimont, Metalle (Struktur und Eigenschaften von Metallen und Legierungen), Springer-Verlag, Berlin 2001  
 H.-J. Bargel, G. Schulze, Werkstoffkunde, Springer-Verlag Berlin 2005  
 J. Rösler, H. Harders, M. Bäker, Mechanisches Verhalten der Werkstoffe, Vieweg+Teubner Wiesbaden, 2008  
 J. Freudenberger: <http://www.ifw-dresden.de/institutes/imw/lectures/lectures/pwe>

**Exercises in Metals**

2174599, SS 2025, 1 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)  
On-Site**

**Content**

Properties of pure elements; thermodynamic foundations of single-component and of binary systems, as well as multiphase systems; nucleation and growth; diffusion processes in crystalline materials; phase diagrams; effects of alloying; nonequilibrium microstructures; heat treatment technology

**Learning objectives:**

The Students have hands-on experience in the application of thermodynamic foundations of phase transformations, the kinetics of phase transformations in the solid state, the mechanisms of microstructure formation and microstructure-property relationships. They can assess the effects of heat treatments and of alloying on the microstructure and the mechanical and physical properties of metallic materials. This competence is in particular practiced for iron- and aluminum-based alloys.

**Requirements:**

Lecture and Tutorials on Materials Physics as well as the lecture on Metals

**Workload:**

Regular attendance: 14 h

Self-study: 16 h

**Organizational issues**

Weitere Informationen zu dieser Veranstaltung finden Sie hier: <https://www.iam.kit.edu/wk/lehre.php>

**Literature**

G. Gottstein: „Materialwissenschaft und Werkstofftechnik: Physikalische Grundlagen“, Springer (2014)  
<http://dx.doi.org/10.1007/978-3-642-36603-1> (frei über die KIT-Lizenz abrufbar)  
 J. Freudenberger: „Skript zur Vorlesung Physikalische Werkstoffeigenschaften“, IFW Dresden (2004)  
<https://www.ifw-dresden.de/de/ifw-institutes/ikm/lectures/vorlesungsskript-physikalische-werkstoffeigenschaften>  
 P. Haasen: „Physikalische Metallkunde“, Cambridge University Press (2003)  
<http://services.bibliothek.kit.edu/primos/start.php?recordid=KITSRC309606810>  
 R.W. Cahn, P. Haasen (Editoren): „Physical Metallurgy“, Serie, North Holland (1996)  
<http://services.bibliothek.kit.edu/primos/start.php?recordid=KITSRC052463656>  
 D. A. Porter, K. Easterling: „Phase Transformation in Metals and Alloys“, Chapman & Hall (2009)  
<http://services.bibliothek.kit.edu/primos/start.php?recordid=KITSRC27759961X>  
 E. Hornbogen, H. Warlimont: „Metalle: Struktur und Eigenschaften von Metallen und Legierungen“, Springer (2016)  
<http://dx.doi.org/10.1007/978-3-662-47952-0> (frei über die KIT-Lizenz abrufbar)  
 E. Hornbogen, G. Eggeler, E. Werner: „Werkstoffe: Aufbau und Eigenschaften von Keramik-, Metall-, Polymer- und Verbundwerkstoffen“, Springer (2012)  
<http://dx.doi.org/10.1007/978-3-642-22561-1> (frei über die KIT-Lizenz abrufbar)  
 H.-J. Bargel, G. Schulze: „Werkstoffkunde“, Springer (2012)  
<http://dx.doi.org/10.1007/978-3-642-17717-0> (frei über die KIT-Lizenz abrufbar)  
 J. Rösler, H. Harders, M. Bäker: „Mechanisches Verhalten der Werkstoffe“, Springer Vieweg (2016)  
<http://dx.doi.org/10.1007/978-3-658-13795-3> (frei über die KIT-Lizenz abrufbar)

**T****3.222 Course: Materials Processing Technology [T-MACH-100295]**

**Responsible:** Dr. Joachim Binder  
Dr.-Ing. Wilfried Liebig

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)



**Type**  
Oral examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	2173540	<a href="#">Materials Processing Technology</a>	3 SWS	Lecture / Practice ( /  )	Liebig, Binder
WT 24/25	2173541	<a href="#">Materials Processing Lab Course</a>	1 SWS	Practical course / 	Liebig, Binder
Exams					
WT 24/25	76-T-MACH-100295	<a href="#">Materials Processing Technology</a>			Liebig, Binder
ST 2025	76-T-MACH-100295	<a href="#">Materials Processing Technology</a>			Liebig, Binder

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Oral exam (lecture + lab course), approx. 25 min, lab course "Materials Processing" has to be finished successfully.

**Prerequisites**

Lab course "Materials Processing" has to be passed successfully in advance.

**Annotation**

Lecture: lecture notes, slides + beamer, blackboard

lab course: experimental equipment, paper, pencil, lab course notes, calculator

**Workload**

180 hours

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

**V****Materials Processing Technology**

2173540, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)  
On-Site**

**Content****Introduction****Polymers:**

Raw materials, materials laws and models, rheology, moulding, forming, joining

**Ceramics:**

raw materials, powder synthesis, additives, moulding and forming of glass, moulding, abrasive techniques, changing properties, final processing

**metals:**

raw materials, materials processing, moulding, forming, cutting, joining

**semiconductors:**

raw materials, moulding, changing properties

**Summary****objectives:**

The students are able to name the different materials processing techniques and can describe their basic principles and allocate them to the different classes of materials processing methods.

They can choose specific processing techniques based on given problems and consider constraints derived from their basic knowledge in materials science.

The students are able to carry out simple experiments with lab scale equipment. They can correlate the processing parameters with resulting material properties by analyzing the materials using adequate testing methods which have to be chosen, evaluated and documented suitable to the problems given.

**requirements:**

none, **Recommendations:** Module "Basics in Materials Science" should be passed

**workload:**

The workload for the study program MatWerk for the lecture "materials processing technology" is 180 h per semester and consists of the presence during the lectures (36 h) including tutorials, presence during the lab course (12 h), preparation and rework time at home (72 h) and preparation time for the oral exam (60 h).

The workload for the study program Mechanical Engineering for the lecture "materials processing technology" is 120 h per semester and consists of the presence during the lectures (36 h) including tutorials, preparation and rework time at home (24 h) and preparation time for the oral exam (60 h).

**Literature**

Literaturhinweise, Unterlagen und Teilmanuskript in der Vorlesung

Presentation slides and additional lecture notes are handed out during the lecture, additional literature recommendations given

**Materials Processing Lab Course**

2173541, WS 24/25, 1 SWS, Language: German, [Open in study portal](#)

**Practical course (P)  
On-Site**

**Content****Content and objectives:**

The students are able to carry out simple experiments with lab scale equipment. They can correlate the processing parameters with resulting material properties by analyzing the materials using adequate testing methods which have to be chosen, evaluated and documented suitable to the problems given.

**Organizational issues**

In den Laborräumen von IAM, wbk und Fhg-ICT. Gruppeneinteilung und Termine werden in VL "Werkstoffprozessstechnik" bekannt gegeben.

**Literature**

Literaturhinweise, Unterlagen und Teilmanuskript in der Vorlesung

Presentation slides and additional lecture notes are handed out during the lecture, additional literature recommendations given

## T

**3.223 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	8	Grade to a third	Each winter term	2

Events					
WT 24/25	2173553	<a href="#">Materials Science and Engineering III</a>	4 SWS	Lecture / 🗎	Heilmaier, Guth
WT 24/25	2173554	<a href="#">Exercises in Materials Science and Engineering III</a>	1 SWS	Practice / 🗎	Heilmaier, Kauffmann
Exams					
WT 24/25	76-T-MACH-105301	<a href="#">Materials Science III</a>			Heilmaier, Guth
ST 2025	76-T-MACH-105301	<a href="#">Materials Science III</a>			Heilmaier, Guth

Legend: 🗎 Online, 🗎 Blended (On-Site/Online), 🗎 On-Site, x Cancelled

**Competence Certificate**

Oral exam, about 35 minutes

**Prerequisites**

T-MACH-110818 - Plasticity of Metals and Intermetallics has not been started

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-110818 - Plasticity of Metals and Intermetallics](#) must not have been started.

**Workload**

240 hours

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

## V

**Materials Science and Engineering III**

2173553, WS 24/25, 4 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
On-Site

**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-Fe<sub>3</sub>C; effects of alloying on Fe-C-alloys; nonequilibrium microstructures; multicomponent iron-based alloys; heat treatment technology; hardenability and hardenability tests.

**learning objectives:**

The students are familiar with the thermodynamic foundations of phase transformations, the kinetics of phase transformations in the solid states (nucleation and growth phenomena), the mechanisms of microstructure formation and microstructure-property relationships and can apply them to metallic materials. They can assess the effects of heat treatments and of alloying on the microstructure and the properties of iron-based materials (steels in particular). They can select steels for structural applications in mechanical engineering and subject them to appropriate heat treatments.

**requirements:**

Basic knowledge in materials science and engineering (Werkstoffkunde I/II)

**workload:**

regular attendance: 53 hours

self-study: 187 hours

**Literature**

Vorlesungsskript; Übungsaufgaben; Bhadeshia, H.K.D.H. & Honeycombe, R.W.K.  
Steels – Microstructure and Properties  
CIMA Publishing, 3. Auflage, 2006



### 3.224 Course: Mathematical Methods in Dynamics [T-MACH-105293]

**Responsible:** Prof. Dr.-Ing. Carsten Proppe

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Written examination

**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	2161206	<a href="#">Mathematical Methods in Dynamics</a>	2 SWS	Lecture /	Proppe
WT 24/25	2161207	<a href="#">Übungen zu Mathematische Methoden der Dynamik</a>	1 SWS	Practice /	Proppe, Luo
ST 2025	2161206	<a href="#">Mathematical Methods in Dynamics</a>	2 SWS	Lecture /	Proppe
Exams					
WT 24/25	76-T-MACH-105293	<a href="#">Mathematical Methods in Dynamics</a>	Proppe		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

written examination, 180 min.

#### Prerequisites

none

#### Workload

180 hours

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



### Mathematical Methods in Dynamics

2161206, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**

#### 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:

Principle of virtual work, variational calculations, Principle of Hamilton

Approximate solution methods:

Methods of weighted residuals, method of Ritz

Applications

**Literature**

Vorlesungsskript (erhältlich im Internet)

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

**Übungen zu Mathematische Methoden der Dynamik**

2161207, WS 24/25, 1 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)  
On-Site**

**Content**

Exercises related to the lecture

**Mathematical Methods in Dynamics**

2161206, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)  
Online**

**Content**

The students know precisely the mathematical methods of dynamics. They are able to use the basic mathematical methods for modelling the dynamical behaviour of elastic and rigid bodies. The students also have a basic understanding of the description of kinematics and kinetics of bodies. They also master the alternative formulations based on weak formulations and variational methods and the approximate solution methods for numerical calculations of the moving behaviour of elastic bodies.

Dynamics of continua:

Concept of continuum, geometry of continua, kinematics and kinetics of continua

Variational principles:

Principle of virtual work, variational calculations, Principle of Hamilton

Approximate solution methods:

Methods of weighted residuals, method of Ritz

**Organizational issues**

Für diese Vorlesung werden online Unterlagen bereitgestellt.

**Literature**

Vorlesungsskript (erhältlich im Internet)

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



## T

**3.225 Course: Mathematical Methods in Fluid Mechanics [T-MACH-105295]**

**Responsible:** Prof. Dr.-Ing. Bettina Frohnapfel  
Dr.-Ing. Davide Gatti

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each summer term	2

Events					
ST 2025	2154540	<a href="#">Mathematical Methods in Fluid Mechanics</a>	4 SWS	Lecture / Practice ( / )	Gatti, Frohnapfel
Exams					
WT 24/25	76-T-MACH-105295	<a href="#">Mathematical Methods in Fluid Mechanics</a>			Frohnapfel
WT 24/25	76-T-MACH-105295 (engl.)	<a href="#">Mathematical Methods in Fluid Mechanics</a>			Frohnapfel, Gatti
ST 2025	76-T-MACH-105295	<a href="#">Mathematical Methods in Fluid Mechanics</a>			Frohnapfel, Gatti
ST 2025	76-T-MACH-105295 (engl.)	<a href="#">Mathematical Methods in Fluid Mechanics</a>			Gatti, Frohnapfel

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

written examination - 90 minutes

**Prerequisites**

T-MACH-113956 must not have been started.

**Recommendation**

Basic Knowledge about Fluid Mechanics

**Workload**

180 hours

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

## V

**Mathematical Methods in Fluid Mechanics**

2154540, SS 2025, 4 SWS, Language: English, [Open in study portal](#)

**Lecture / Practice (VÜ)  
On-Site**

**Content**

The students can simplify the Navier-Stokes equations for specific flow problems. They are able to employ mathematical methods in fluid mechanics effectively in order to solve the resulting governing equations analytically, if possible, or to enable simpler numerical solution of the problem. The students can describe the limits of applicability of the assumptions made to model the flow behavior.

The lecture will cover a selection of the following topics:

- Creeping flows (Stokes flow)
- Lubrication theory
- Potential flow theory
- Boundary-layer theory
- Laminar-turbulent transition (linear stability theory)
- Turbulent flows

**Literature**

Kundu, P.K., Cohen, K.M.: Fluid Mechanics, Elsevier, 4th Edition, 2008

Kuhlmann, H.: Strömungsmechanik, Pearson, 2007

Spurk, J. H.: Strömungslehre, Springer, 2006

Zierep, J., Bühler, K.: Strömungsmechanik, Springer, 1991

Schlichting H., Gersten K., Grenzschichttheorie, Springer, 2006

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

## T

**3.226 Course: Mathematical Methods in Micromechanics [T-MACH-110378]****Responsible:** Prof. Dr.-Ing. Thomas Böhlke**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	5	Grade to a third	Each summer term	1 terms	2

Events					
ST 2025	2162280	<a href="#">Mathematical Methods in Micromechanics</a>	2 SWS	Lecture / 	Böhlke, Langhoff
Exams					
WT 24/25	76-T-MACH-110378	<a href="#">Mathematical Methods in Micromechanics</a>			Böhlke

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam (180 min). Additives as announced.

prerequisite to registration to the exam: Passing the tutorial to Mathematical Methods in Micromechanics (T-MACH-110379)

**Prerequisites**

Passing the tutorial to Mathematical Methods in Micromechanics (T-MACH-110379)

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-110379 - Tutorial Mathematical Methods in Micromechanics](#) must have been passed.

**Workload**

150 hours

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

## V

**Mathematical Methods in Micromechanics**2162280, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

Fundamentals of linear isotropic and anisotropic thermoelasticity theory,  
 Description of microstructures,  
 Micro-macro relations of linear thermoelasticity theory,  
 Approximations and bounds for the effective thermoelastic material behavior,  
 Microstructure Sensitive Design of materials,  
 Selected problems in the context of homogenization of nonlinear material properties



**Literature**





- Vorlesungsskript
- Gummert, P.; Reckling, K.-A.: Mechanik. Vieweg 1994
- Gross, D., Seelig, T.: Bruchmechanik – Mit einer Einführung in die Mikromechanik, Springer 2002
- Klingbeil, E.: Variationsrechnung, BI Wissenschaftsverlag, 1977
- Torquato, S.: Random Heterogeneous Materials. Springer, 2002

## T

**3.227 Course: Mathematical Methods of Vibration Theory [T-MACH-105294]****Responsible:** Prof. Dr.-Ing. Alexander Fidlin**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each summer term	2

Events					
ST 2025	2162241	<a href="#">Mathematical methods of vibration theory</a>	2 SWS	Lecture / 	Fidlin, Genda
ST 2025	2162242	<a href="#">Mathematical methods of vibration theory (Tutorial)</a>	2 SWS	Practice / 	Fidlin, Mukherjee
Exams					
WT 24/25	76-T-MACH-105294	<a href="#">Mathematical Methods of Vibration Theory</a>	Fidlin		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written examination, 180 min.

**Prerequisites**

none

**Recommendation**

Engineering Mechanics III/IV

**Workload**

180 hours

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

## V

**Mathematical methods of vibration theory**2162241, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
On-Site**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

**Literature**

Riemer, Wedig, Wauer: Mathematische Methoden der Technischen Mechanik

## V

**Mathematical methods of vibration theory (Tutorial)**2162242, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Practice (Ü)**  
On-Site**Content**

Seven tutorials with examples of the contents of the course

**Literature**

Riemer, Wedig, Wauer: Mathematische Methoden der Technischen Mechanik

## T

**3.228 Course: Mathematical Models and Methods for Production Systems [T-MACH-105189]**

**Responsible:** Dr.-Ing. Marion Baumann  
Prof. Dr.-Ing. Kai Furmans

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2117059	<a href="#">Mathematical models and methods for Production Systems</a>	4 SWS	Lecture / Practice ( / )	Baumann, Furmans
Exams					
WT 24/25	76-T-MACH-105189	<a href="#">Mathematical models and methods for Production Systems</a>	Furmans, Baumann		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**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

**Workload**

180 hours

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

## V

**Mathematical models and methods for Production Systems**

2117059, WS 24/25, 4 SWS, Language: English, [Open in study portal](#)

**Lecture / Practice (VÜ)  
On-Site**

**Content****Media:**

black board, lecture notes, presentations

**Learning Content:**

- single server systems: M/M/1, M/G/1: priority rules, model of failures
- networks: open and closed approximations, exact solutions and approximations
- application to flexible manufacturing systems, AGV (automated guided vehicles) - systems
- modeling of control approaches like constant work in process (ConWIP) or kanban
- discrete-time modeling of queuing systems

**Learning Goals:**

Students are able to:

- Describe queueing systems with analytical solvable stochastic models,
- Derive approaches for modeling and controlling material flow and production systems based on models of queueing theory,
- Use simulation and exact methods.

**Recommendations:**

- Basic knowledge of statistic
- recommended compulsory optional subject: Stochastics
- recommended lecture: Materials flow in logistic systems (also parallel)

**Workload:**

regular attendance: 42 hours

self-study: 198 hours

**Organizational issues**

- Im Wintersemester 2024/2025 ist die Veranstaltung auf maximal 30 Teilnehmer beschränkt.
- Die Anmeldung erfolgt durch Beitritt zum ILIAS-Kurs und Ausfüllen des Anmeldeformulars (erforderliche Felder beim Beitritt zum ILIAS-Kurs).
- Die Anmeldung ist vom 01.09.2024 bis zum 30.09.2024 möglich. Die verfügbaren Plätze werden anschließend vergeben.

**Die nächste Veranstaltung findet im Sommersemester 2026 statt!**

**Literature**

Ronald W. Wolff (1989) Stochastic Modeling and the Theory of Queues, Englewood Cliffs, NJ : Prentice-Hall.

John A. Buzacott, J. George Shanthikumar (1993) Stochastic Models of Manufacturing Systems, Upper Saddle River, NJ : Prentice Hall.

**T****3.229 Course: Mathematical Models and Methods of the Theory of Thermochemical Processes [T-MACH-113942]****Responsible:** Dr. Viatcheslav Bykov**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	2

**Competence Certificate**

Oral exam, approx. 30 min

**Prerequisites**

T-MACH-114062 and T-MACH-105419 must not be started

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-114062 - Mathematical Models and Methods of the Theory of Thermochemical Processes](#) must not have been started.

**Workload**

120 hours

**T****3.230 Course: Mathematical Models and Methods of the Theory of Thermochemical Processes [T-MACH-114062]****Responsible:** Dr. Viatcheslav Bykov**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

**Competence Certificate**

Oral exam, approx. 30 min

**Prerequisites**

T-MACH-113942 and T-MACH-105419 must not be started

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-113942 - Mathematical Models and Methods of the Theory of Thermochemical Processes](#) must not have been started.

**Workload**

120 hours





### 3.231 Course: Measurement and Control Systems [T-MACH-103622]

**Responsible:** Prof. Dr.-Ing. Christoph Stiller

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Written examination

**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	3137020	<a href="#">Measurement and Control Systems</a>	3 SWS	Lecture /	Stiller
WT 24/25	3137021	<a href="#">Measurement and Control Systems (Tutorial)</a>	1 SWS	Practice /	Stiller
Exams					
WT 24/25	76-T-MACH-103622	<a href="#">Measurement and Control Systems</a>	Stiller		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

oral exam (30 min)

#### Prerequisites

none

#### Workload

180 hours

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



#### Measurement and Control Systems

3137020, WS 24/25, 3 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

##### Lehrinhalt (EN):

- 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

##### Lernziele (EN):

Measurement and control of physical entities is a vital requirement in most technical applications. Such entities may comprise e.g. pressure, temperature, flow, rotational speed, power, voltage and electrical current, etc.. From a general perspective, the objective of measurement is to obtain information about the state of a system while control aims to influence the state of a system in a desired manner. This lecture provides an introduction to this field and general systems theory. The control part of the lecture presents classical linear control theory. The measurement part discusses electrical measurement of non-electrical entities.

Nachweis (EN): written exam; duration 2,5 h; paper reference materials only (no calculator)

Arbeitsaufwand (EN): 180 hours

#### Organizational issues

Die Vorlesung startet am 22.10.2024.

**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. Schröder: 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

**Measurement and Control Systems (Tutorial)**

3137021, WS 24/25, 1 SWS, Language: English, [Open in study portal](#)

**Practice (Ü)  
On-Site**

**Content**

Tutorial for Measurement and Control Systems



### 3.232 Course: Measurement Instrumentation Lab [T-MACH-105300]

**Responsible:** Jonas Merkert  
Prof. Dr.-Ing. Christoph Stiller

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each summer term	1

Events					
ST 2025	2138328	<a href="#">Measurement Instrumentation Lab</a>	2 SWS	Practical course /	Stiller, Merkert

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

Non graded colloquia

#### Prerequisites

none

#### Workload

120 hours

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



### Measurement Instrumentation Lab

2138328, SS 2025, 2 SWS, Language: German/English, [Open in study portal](#)

**Practical course (P)**  
**On-Site**

#### Content

Please consider the bulletin on our website!

#### A Signal recording

- measurement of temperature
- measurement of lengths

#### B Signal pre-processing

- bridge circuits and principles of measurement
- analog/digital transducers

#### C Signal processing

- measuring stochastic signals

#### D Complete systems

- system identification
- inverse pendulum
- mobile robot platform

#### Recommendations:

Basic studies and preliminary examination; basic lectures in automatic control

Arbeitsaufwand: 90 hours

#### Lernziele (EN):

The laboratory complements the course "Introduction to Measurement and Control". While the course is organized into principles and subsystems, the laboratory presents complete measurement systems and methods for the most relevant industrial measurands.

#### Literature

Anleitungen auf der Homepage des Instituts erhältlich.

Instructions to the experiments are available on the institute's website

KIT Department of Mechanical Engineering - Non-degree Studies (Domestic Degree at Another Higher Education Institution)  
Module Handbook as of 21/02/2025

**3.233 Course: Mechanics and Strength of Polymers [T-MACH-105333]****Responsible:** Hon.-Prof. Dr. Bernd-Steffen von Bernstorff**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
2

Events					
WT 24/25	2173580	<a href="#">Mechanics and Strengths of Polymers</a>	2 SWS	Lecture /	von Bernstorff
Exams					
WT 24/25	76-T-MACH-105333	<a href="#">Mechanics and Strengths of Polymers</a>			von Bernstorff

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Oral exam, about 25 minutes

**Prerequisites**

none

**Recommendation**

Basic knowledge in materials science (e.g. lecture materials science I and II)

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***Mechanics and Strengths of Polymers**2173580, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****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

**learning objectives:**

The students are prepared to

- repeat the calculus on strength and design of engineering parts exposed to complex loadings,
- estimate the influence of time and temperature on the strength of polymeric materials,
- relate the strength of materials to their molecular structure, morphology and processing parameters and
- derive failure mechanisms for homogenous polymers and composite materials therefrom.

**requirements:**

basic knowledge in materials science (e.g. lecture materials science I and II)

**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).

**Organizational issues**[berndvonbernstorff@t-online.de](mailto:berndvonbernstorff@t-online.de)**Literature**

Literaturliste, spezielle Unterlagen und ein Teilmanuskript werden in der Vorlesung ausgegeben

**3.234 Course: Mechanics in Microtechnology [T-MACH-105334]**

**Responsible:** Prof. Dr. Christian Greiner  
Dr. Patric Gruber

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

Events					
WT 24/25	2181710	<a href="#">Mechanics in Microtechnology</a>	2 SWS	Lecture /	Gruber, Greiner
Exams					
WT 24/25	76-T-MACH-105334	<a href="#">Mechanics in Microtechnology</a>			Gruber, Greiner
ST 2025	76-T-MACH-105334	<a href="#">Mechanics in Microtechnology</a>			Gruber, Greiner

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Oral examination, ca. 30 min

**Prerequisites**

none

**Workload**

120 hours

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

**Mechanics in Microtechnology**

2181710, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**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 Mechanical Parameters such as Young's Modulus and Yield Strength; Thin Film Adhesion and Stiction
7. Transduction: Piezo-resistivity, Piezo-electric Effect, Electrostatics,...
8. Actuation: Inverse Piezo-electric Effect, Shape Memory, Electromagnetic Actuation,...

The students know and understand size and scaling effects in micro- and nanosystems. They understand the impact of mechanical phenomena in small dimensions. Based on this they can judge how they determine material processing as well as working principles and design of microsensors and microactuators.

regular attendance: 22,5 hours

self-study: 97,5 hours

oral exam ca. 30 minutes


**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

**3.235 Course: Mechanics of Laminated Composites [T-MACH-108717]****Responsible:** Prof. Dr. Eckart Schnack**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2161983	<a href="#">Mechanics of laminated composites</a>	2 SWS	Lecture / 	Schnack
Exams					
WT 24/25	76-T-MACH-108717	<a href="#">Mechanics of Laminated Composites</a>			

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral exam, approx. 20 minutes

**Prerequisites**

none

**Annotation**

The lecture notes are made available via ILIAS.

**Workload**

120 hours

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

V

**Mechanics of laminated composites**2161983, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

Definition of composites, definition of static and kinematic groups. Definition of material laws. Transformation of the state values of composites and transformation of the material properties for the coordinate systems in the design of machine structures.



### 3.236 Course: Mechano-Informatics and Robotics [T-INFO-101294]

**Responsible:** Prof. Dr.-Ing. Tamim Asfour  
**Organisation:** KIT Department of Informatics  
**Part of:** [M-MACH-104883 - Courses of the KIT Department of Informatics](#)

**Type**  
Written examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2400077	<a href="#">Mechano-Informatics and Robotics</a>	2 SWS	Lecture /	Asfour, Krebs, Rietsch, Gao
Exams					
WT 24/25	7500176	<a href="#">Mechano-Informatics and Robotics</a>			Asfour

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 60 minutes.

#### Prerequisites

None.

#### Recommendation

Basispraktikum Mobile Roboter

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



### Mechano-Informatics and Robotics

2400077, WS 24/25, 2 SWS, Language: German/English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

The lecture addresses various engineering and algorithmic aspects and topics in robotics which are illustrated and explained based on examples originating from current research conducted in the field of humanoid robotics. First, this lecture gives an introduction into the mathematical fundamentals which are needed to describe a robotic system as well as the basic algorithms commonly applied in motion planning.

Subsequently, models and methods are introduced with which dynamical systems can be formalized and which can be used to encode and represent robot actions. To do so, we will discuss linear time-invariant systems in state.

#### Learning Objectives:

Based on the example of robotics students understand the synergistic effects and interdisciplinarity of mechatronics and informatics, the embedded systems, the control, and the methods and the algorithms. They are acquainted with the basic terminology and the methods which are common in robotics, signal processing, action representation, machine learning and cognitive systems. They are capable of applying fundamental state-of-the-art methods and tools for the development and programming of robots. Based on examples originating from current research conducted in the fields of humanoid robotics, the students interactively learn how to identify and formalize problems and tasks and how to develop solutions in an analytical and goal-directed way.

#### Organizational issues

Zugehörige Veranstaltungen: Empfehlung - Basispraktikum Mobile Roboter

Die Erfolgskontrolle erfolgt in Form einer schriftlichen Prüfung in englischer Sprache im Umfang von i.d.R. 60 Minuten nach § 4 Abs. 2 Nr. 1 SPO.

#### Arbeitsaufwand:

2h Präsenz

+ 2\*2h = 4h Vor/Nachbereitung

+ 30h Prüfungsvorbereitung

120h

## T

**3.237 Course: Mechatronical Systems and Products [T-MACH-105574]**

**Responsible:** Prof. Dr.-Ing. Sören Hohmann  
Prof. Dr.-Ing. Sven Matthiesen

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)





**Type**  
Written examination




**Credits**  
3

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
4

Events					
WT 24/25	2303003	<a href="#">Exercises for 2303161 Mechatronical Systems and Products</a>	1 SWS	Practice / 	Matthiesen, Hohmann
WT 24/25	2303161	<a href="#">Mechatronical Systems and Products</a>	2 SWS	Lecture / 	Matthiesen, Hohmann
ST 2025	2303003	<a href="#">Exercises for 2303161 Mechatronical Systems and Products</a>	1 SWS	Practice / 	Matthiesen, Hohmann
ST 2025	2303161	<a href="#">Mechatronical Systems and Products</a>	2 SWS	Lecture / 	Matthiesen, Hohmann
Exams					
WT 24/25	76-T-MACH-105574	<a href="#">Mechatronical Systems and Products</a>	Matthiesen		
ST 2025	76-T-MACH-105574	<a href="#">Mechatronical Systems and Products</a>	Matthiesen		

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

written examination (duration: 60min)

**Annotation**

All relevant content (scripts, exercise sheets, etc.) for the course can be obtained via the eLearning platform ILIAS. To participate in the course, please complete the survey "Anmeldung und Gruppeneinteilung" in ILIAS before the start of the semester.


**Workload**




90 hours



**T****3.238 Course: Medical Imaging Technology [T-ETIT-113625]****Responsible:** Prof. Dr.-Ing. Maria Francesca Spadea**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each summer term	1

Events					
ST 2025	2305263	<a href="#">Medical Imaging Technology</a>	4 SWS	Lecture / Practice ( /  )	Spadea, Arndt

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

The examination takes place in form of a written examination lasting 90 minutes. The course grade is the grade of the written exam.




**Prerequisites**

none

## T

**3.239 Course: Medical Measurement Technology [T-ETIT-113607]****Responsible:** Prof. Dr. Werner Nahm**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2305269	<a href="#">Medical Measurement Techniques</a>	4 SWS	Lecture / 	Nahm
Exams					
WT 24/25	7305270	<a href="#">Medizinische Messtechnik</a>			Nahm

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

The assessment takes place in the form of a written examination lasting 120 min. and 120 points.

The module grade is the grade of the written exam.

Bonus points can also be awarded for a student presentation within the lecture. Bonus points are awarded as follows:

- solving bonus tasks is voluntary.
- students register in ILIAS in groups of max. 3 participants for a bonus task.
- the solution to the bonus task must be entered in ILIAS by the specified submission deadline.
- the solutions are read by the lecture assistants and, if necessary, corrected and approved.
- the groups present their solutions in the lecture (20 min).
- the bonus points are awarded individually to each student by the lecturer on the basis of the written solution and the presentation.
- Each student can earn a maximum of 6 bonus points.
- Bonus points can only be earned once.

The bonus points are credited as follows:


- A maximum of 6 points can be credited to the exam result for the passed bonus task.
- The grade can thus be improved by a maximum of one grade step.
- The total number of points remains limited to 120 points. The bonus points are only taken into account if the exam is passed. Bonus points do not expire and are retained for any examinations taken at a later date.





**Prerequisites**

none

**T****3.240 Course: Metal Forming [T-MACH-105177]****Responsible:** Prof. Dr.-Ing. Thomas Herlan**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	2

Events					
ST 2025	2150681	<a href="#">Metal Forming</a>	2 SWS	Lecture / 	Herlan

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral Exam (20 min)

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Metal Forming**2150681, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
On-Site**

**Content**

At the beginning of the lecture the basics of metal forming are briefly introduced. The focus of the lecture is on massive forming (forging, extrusion, rolling) and sheet forming (car body forming, deep drawing, stretch drawing). This includes the systematic treatment of the appropriate metal forming Machines and the corresponding tool technology. Aspects of tribology, as well as basics in material science and aspects of production planning are also discussed briefly. The plastic theory is presented to the extent necessary in order to present the numerical simulation method and the FEM computation of forming processes or tool design. The lecture will be completed by product samples from the forming technology.

The topics are as follows:

- Introduction and basics
- Hot forming
- Metal forming machines
- Tools
- Metallographic fundamentals
- Plastic theory
- Tribology
- Sheet forming
- Extrusion
- Numerical simulation

**Learning Outcomes:**

The students ...

- are able to reflect the basics, forming processes, tools, Machines and equipment of metal forming in an integrated and systematic way.
- are capable to illustrate the differences between the forming processes, tools, machines and equipment with concrete examples and are qualified to analyze and assess them in terms of their suitability for the particular application.
- are also able to transfer and apply the acquired knowledge to other metal forming problems.

**Workload:**

regular attendance: 21 hours

self-study: 99 hours

**Organizational issues**

Vorlesungstermine freitags, wöchentlich.

Die konkreten Termine werden in der ersten Vorlesung bekannt gegeben und auf der Institutshomepage und ILIAS veröffentlicht.

Zur Vertiefung des im Rahmen der Lehrveranstaltung erworbenen Wissens werden die theoretischen Vorlesungseinheiten durch Praxiseinheiten im Umfeld der Karlsruher Forschungsfabrik (<https://www.karlsruher-forschungsfabrik.de>) unterstützt.

The theoretical lectures are complemented by practical lectures in the Karlsruhe Research Factory (<https://www.karlsruher-forschungsfabrik.de/en.html>) to deepen the acquired knowledge.

**Literature****Medien:**

Skript zur Veranstaltung wird über (<https://ilias.studium.kit.edu/>) bereitgestellt.

**Media:**

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



### 3.241 Course: Metallographic Lab Class [T-MACH-105447]

**Responsible:** Prof. Dr.-Ing. Martin Heilmaier  
Dr.-Ing. Alexander Kauffmann

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Completed coursework

**Credits**  
4

**Grading scale**  
pass/fail

**Recurrence**  
Each term

**Version**  
3

Events					
WT 24/25	2175590	<a href="#">Metallographic Lab Class</a>	3 SWS	Practical course /	Kauffmann
Exams					
WT 24/25	76-T-MACH-105447	<a href="#">Metallographic Lab Class</a>	Heilmaier, Kauffmann		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

Colloquium for every experiment, about 60 minutes, protocol

#### Prerequisites

T-MACH-114076 - Metallographic Lab Class must not have started.

#### Workload

120 hours

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



#### Metallographic Lab Class

2175590, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Practical course (P)**  
**On-Site**

#### Content

The lab course deals with the practical application of metallographic procedures, e.g. starting from sample extraction to light optical (LOM) and scanning electron microscopy (SEM). The preparation of metallographic samples takes up to two lab days. LOM and SEM analyses are performed on another two days. All results are carefully registered by the students and discussed in a separate session. Finally, the students can independently apply their theoretical and practical knowledge by the preparation and analysis of industrial relevant metallic materials. The content of the lab course will be documented in the form of individual protocols by the students.

Before starting with the lab course, the students need to prepare the fundamentals that are tested in an online test. Lecture notes as starting point are provided.

#### Learning objectives:

The students can perform standard metallographic preparation routines as well as qualitative and quantitative microstructure analysis. The students are able to interpret microstructures and the correlations of microstructural constituent and processing and properties of metallic materials.

#### Prerequisites:

Materials Science and Engineering I and II or Materials Physics und Metals

#### Arbeitsaufwand:

on-site: 25 h

private studies: 95 h

**Literature**

## Praktikumsskript

Weiterführende Informationen gibt es hier:

G. Gottstein: „Materialwissenschaft und Werkstofftechnik: Physikalische Grundlagen“, Springer (2014)

<http://dx.doi.org/10.1007/978-3-642-36603-1> (frei über die KIT-Lizenz abrufbar)

J. Freudenberger: „Skript zur Vorlesung Physikalische Werkstoffeigenschaften“, IFW Dresden (2004)

<https://www.ifw-dresden.de/de/ifw-institutes/ikm/lectures/vorlesungsskript-physikalische-werkstoffeigenschaften>

P. Haasen: „Physikalische Metallkunde“, Cambridge University Press (2003)

<http://services.bibliothek.kit.edu/primo/start.php?recordid=KITSRC309606810>

R.W. Cahn, P. Haasen (Editoren): „Physical Metallurgy“, Serie, North Holland (1996)

<http://services.bibliothek.kit.edu/primo/start.php?recordid=KITSRC052463656>

D. A. Porter, K. Easterling: „Phase Transformation in Metals and Alloys“, Chapman & Hall (2009)

<http://services.bibliothek.kit.edu/primo/start.php?recordid=KITSRC27759961X>

E. Hornbogen, H. Warlimont: „Metalle: Struktur und Eigenschaften von Metallen und Legierungen“, Springer (2016)

<http://dx.doi.org/10.1007/978-3-662-47952-0> (frei über die KIT-Lizenz abrufbar)

E. Hornbogen, G. Eggeler, E. Werner: „Werkstoffe: Aufbau und Eigenschaften von Keramik-, Metall-, Polymer- und Verbundwerkstoffen“, Springer (2012)

<http://dx.doi.org/10.1007/978-3-642-22561-1> (frei über die KIT-Lizenz abrufbar)

H.-J. Bargel, G. Schulze: „Werkstoffkunde“, Springer (2012)

<http://dx.doi.org/10.1007/978-3-642-17717-0> (frei über die KIT-Lizenz abrufbar)

J. Rösler, H. Harders, M. Bäker: „Mechanisches Verhalten der Werkstoffe“, Springer Vieweg (2016)

<http://dx.doi.org/10.1007/978-3-658-13795-3> (frei über die KIT-Lizenz abrufbar)

**3.242 Course: Metals [T-MACH-105468]**

**Responsible:** Prof. Dr.-Ing. Martin Heilmaier  
Prof. Dr. Astrid Pundt

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each summer term	1

Events					
ST 2025	2174598	<a href="#">Metals</a>	4 SWS	Lecture /	Pundt, Wagner
ST 2025	2174599	<a href="#">Exercises in Metals</a>	1 SWS	Practice /	Wagner

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Oral exam, about 20 minutes

**Prerequisites**

none

**Workload**

180 hours

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

**Metals**

2174598, SS 2025, 4 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

Properties of pure elements; thermodynamic foundations of single-component and of binary systems, as well as multiphase systems; nucleation and growth; diffusion processes in crystalline materials; phase diagrams; effects of alloying; nonequilibrium microstructures; heat treatment technology

**learning objectives:**

The students are familiar with the thermodynamic foundations of phase transformations, the kinetics of phase transformations in the solid state, the mechanisms of microstructure formation and microstructure-property relationships and can apply them to metallic materials. They can assess the effects of heat treatments and of alloying on the microstructure and the mechanical and physical properties of metallic materials. This competence is in particular deepened for iron- and aluminum-based alloys.

**requirements:**

Materials physics

**workload:**

Regular attendance: 42 h

Self-study: 138 h

**Organizational issues**

Weitere Informationen zu dieser Veranstaltung finden Sie hier: <https://www.iam.kit.edu/wk/lehre.php>

**Literature**

D.A. Porter, K. Easterling, Phase Transformation in Metals and Alloys, 2nd edition, Chapman & Hall, London 1997,

G. Gottstein. Physikalische Grundlagen der Materialkunde, Springer 2007

E. Hornbogen, H. Warlimont, Metalle (Struktur und Eigenschaften von Metallen und Legierungen), Springer-Verlag, Berlin 2001

H.-J. Bargel, G. Schulze, Werkstoffkunde, Springer-Verlag Berlin 2005

J. Rösler, H. Harders, M. Bäker, Mechanisches Verhalten der Werkstoffe, Vieweg+Teubner Wiesbaden, 2008

J. Freudenberger: <http://www.ifw-dresden.de/institutes/imw/lectures/lectures/pwe>

**Exercises in Metals**

2174599, SS 2025, 1 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)**  
**On-Site**

**Content**

Properties of pure elements; thermodynamic foundations of single-component and of binary systems, as well as multiphase systems; nucleation and growth; diffusion processes in crystalline materials; phase diagrams; effects of alloying; nonequilibrium microstructures; heat treatment technology

**Learning objectives:**

The Students have hands-on experience in the application of thermodynamic foundations of phase transformations, the kinetics of phase transformations in the solid state, the mechanisms of microstructure formation and microstructure-property relationships. They can assess the effects of heat treatments and of alloying on the microstructure and the mechanical and physical properties of metallic materials. This competence is in particular practiced for iron- and aluminum-based alloys.

**Requirements:**

Lecture and Tutorials on Materials Physics as well as the lecture on Metals

**Workload:**

Regular attendance: 14 h

Self-study: 16 h

**Organizational issues**

Weitere Informationen zu dieser Veranstaltung finden Sie hier: <https://www.iam.kit.edu/wk/lehre.php>

**Literature**

G. Gottstein: „Materialwissenschaft und Werkstofftechnik: Physikalische Grundlagen“, Springer (2014)

<http://dx.doi.org/10.1007/978-3-642-36603-1> (frei über die KIT-Lizenz abrufbar)

J. Freudenberger: „Skript zur Vorlesung Physikalische Werkstoffeigenschaften“, IFW Dresden (2004)

<https://www.ifw-dresden.de/de/ifw-institutes/ikm/lectures/vorlesungsskript-physikalische-werkstoffeigenschaften>

P. Haasen: „Physikalische Metallkunde“, Cambridge University Press (2003)

<http://services.bibliothek.kit.edu/primos/start.php?recordid=KITSRC309606810>

R.W. Cahn, P. Haasen (Editoren): „Physical Metallurgy“, Serie, North Holland (1996)

<http://services.bibliothek.kit.edu/primos/start.php?recordid=KITSRC052463656>

D. A. Porter, K. Easterling: „Phase Transformation in Metals and Alloys“, Chapman & Hall (2009)

<http://services.bibliothek.kit.edu/primos/start.php?recordid=KITSRC27759961X>

E. Hornbogen, H. Warlimont: „Metalle: Struktur und Eigenschaften von Metallen und Legierungen“, Springer (2016)

<http://dx.doi.org/10.1007/978-3-662-47952-0> (frei über die KIT-Lizenz abrufbar)

E. Hornbogen, G. Eggeler, E. Werner: „Werkstoffe: Aufbau und Eigenschaften von Keramik-, Metall-, Polymer- und Verbundwerkstoffen“, Springer (2012)

<http://dx.doi.org/10.1007/978-3-642-22561-1> (frei über die KIT-Lizenz abrufbar)

H.-J. Bargel, G. Schulze: „Werkstoffkunde“, Springer (2012)

<http://dx.doi.org/10.1007/978-3-642-17717-0> (frei über die KIT-Lizenz abrufbar)

J. Rösler, H. Harders, M. Bäker: „Mechanisches Verhalten der Werkstoffe“, Springer Vieweg (2016)

<http://dx.doi.org/10.1007/978-3-658-13795-3> (frei über die KIT-Lizenz abrufbar)




**T****3.243 Course: Methods and Processes of PGE - Product Generation Engineering [T-MACH-109192]**





**Responsible:** Prof. Dr.-Ing. Albert Albers  
 Prof. Dr.-Ing. Norbert Burkardt  
 Prof. Dr.-Ing. Sven Matthiesen

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each summer term	1

Events					
ST 2025	2146176	<a href="#">Methods and Processes of PGE – Product Generation Engineering</a>	4 SWS	Lecture / 	Albers, Düser
Exams					
WT 24/25	76-T-MACH-105382	<a href="#">Methods and Processes of PGE - Product Generation Engineering</a>			Albers, Burkardt
WT 24/25	76-T-MACH-105382-en	<a href="#">Methods and Processes of PGE - Product Generation Engineering</a>			Albers
ST 2025	76-T-MACH-105382	<a href="#">Product Development - Methods of Product Development</a>			Albers, Düser
ST 2025	76-T-MACH-105382-en	<a href="#">Methods and Processes of PGE - Product Generation Engineering</a>			Albers, Düser

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Written exam (processing time: 120 min + 10 min reading time)

Auxiliaries:

- Calculator
- German dictionary (books only)

**Prerequisites**

None

**Annotation**

This lecture is the basis for the main subject Integrated Product Development, which is offered as a specialisation.

**Workload**

180 hours

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

**V****Methods and Processes of PGE – Product Generation Engineering**

2146176, SS 2025, 4 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content****Note:**

This lecture is the basis for the main subject Integrated Product Development, which is offered as a specialisation.

**Recommendations:**

none

**Workload:**

regular attendance: 39 h

self-study: 141 h

**Examination:**

Written exam

Duration: 120 minutes (+10 minutes reading time)

Auxiliaries:

- Calculator
- German dictionary (books only)

**Course content:**

Basics of Product Development: Basic Terms, Classification of the Product

Development into the industrial environment, generation of costs / responsibility for costs

Concept Development: List of demands / Abstraction of the Problem Definition / Creativity Techniques / Evaluation and selection of solutions

Drafting : Prevailing basic rules of Design / Design Principles as a problem oriented accessory

Rationalization within the Product Development: Basics of Development

Management/ Simultaneous Engineering and Integrated Product Development/Development of Product Lines and Modular Construction Systems

Quality Assurance in early Development Phases : Methods of Quality Assurance in an overview/QFD/FMEA

**Learning objectives:**

The students are able to ...

- classify product development in companies and differentiate between different types of product development.
- name the relevant influencing factors of a market for product development.
- name, compare and use the central methods and process models of product development within moderate complex technical systems.
- explain problem solving techniques and associated development methods.
- explain product profiles and to differentiate and choose suitable creative techniques of solution/idea generation finding on this basis.
- use design guidelines to create simple technical systems and to explain these guidelines.
- name and compare quality assurance methods; to choose and use suitable methods for particular applications.
- explain the different methods of design of experiment.
- explain the costs in development process.

**Literature**



Vorlesungsunterlagen





Pahl, Beitz: Konstruktionslehre, Springer-Verlag 1997

Hering, Triemel, Blank: Qualitätssicherung für Ingenieure; VDI-Verlag, 1993

## T

**3.244 Course: Methods of Signal Processing [T-ETIT-100694]****Responsible:** Prof. Dr.-Ing. Michael Heizmann**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2302113	<a href="#">Signal Processing Methods</a>	2 SWS	Lecture / 	Wahls
WT 24/25	2302115	<a href="#">Tutorial to 2302113 Signal Processing Methods</a>	2 SWS	Practice / 	Wahls, Al-Hammadi
Exams					
WT 24/25	7302113	<a href="#">Signal Processing Methods</a>	Wahls		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Prerequisites**

none


**T****3.245 Course: Micro Magnetic Resonance [T-MACH-105782]**





**Responsible:** Prof. Dr. Jan Gerrit Korvink  
Dr. Neil MacKinnon

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each winter term	1

Events					
WT 24/25	2141501	<a href="#">Micro Magnetic Resonance</a>	2 SWS	Seminar / 	MacKinnon, Badilita, Jouda, Korvink
Exams					
WT 24/25	76-T-MACH-105782	<a href="#">Micro Magnetic Resonance</a>	Korvink, MacKinnon		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Own Presentation, participation at the course discussions, result is passed or failed.

**Prerequisites**

none

**Workload**

120 hours

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

**V****Micro Magnetic Resonance**

2141501, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)

**Seminar (S)**  
**Blended (On-Site/Online)**

**3.246 Course: Microactuators [T-MACH-101910]****Responsible:** Prof. Dr. Manfred Kohl**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	3

Events					
ST 2025	2142881	<a href="#">Microactuators</a>	2 SWS	Lecture /	Kohl
Exams					
WT 24/25	76-T-MACH-101910	<a href="#">Microactuators</a>			Kohl
ST 2025	76-T-MACH-101910	<a href="#">Microactuators</a>			Kohl

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

written exam, 60 min.

**Prerequisites**

T-MACH-114036 must not be started

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***Microactuators**2142881, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

- Basic knowledge in the material science of the actuation principles
- Layout and design optimization
- Fabrication technologies
- Selected developments
- Applications

The lecture includes amongst others the following topics:

- Microelectromechanical systems: linear actuators, microrelais, micromotors
- Medical technology and life sciences: Microvalves, micropumps, microfluidic systems
- Microrobotics: Microgrippers, polymer actuators (smart muscle)
- Information technology: Optical switches, mirror systems, read/write heads

**Literature**

- Folienskript "Mikroaktorik"
- D. Jendritza, Technischer Einsatz Neuer Aktoren: Grundlagen, Werkstoffe, Designregeln und Anwendungsbeispiele, Expert-Verlag, 3. Auflage, 2008
- M. Kohl, Shape Memory Microactuators, M. Kohl, Springer-Verlag Berlin, 2004
- N.TR. Nguyen, S.T. Wereley, Fundamentals and applications of Microfluidics, Artech House, Inc. 2002
- H. Zappe, Fundamentals of Micro-Optics, Cambridge University Press 2010

**3.247 Course: Microenergy Technologies [T-MACH-105557]**

**Responsible:** Prof. Dr. Manfred Kohl  
Dr. Jingyuan Xu

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2142897	<a href="#">Microenergy Technologies</a>	2 SWS	Lecture /	Xu
Exams					
WT 24/25	76-T-MACH-105557	<a href="#">Microenergy Technologies</a>			Kohl
ST 2025	76-T-MACH-105557	<a href="#">Microenergy Technologies</a>			Kohl

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Oral examination (30 Min.)

**Prerequisites**

none

**Workload**

120 hours

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

**Microenergy Technologies**

2142897, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**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 using different conversion principles (piezo, electrostatic, electromagnetic, etc.)
- Thermoelectric energy generation
- Novel thermal energy conversion principles (thermomagnetic, pyroelectric)
- Miniature scale solar devices
- RF energy harvesting
- Miniature scale heat pumping
- Solid-state cooling technologies (magneto-, electro-, mechanocalorics)
- Power management
- Energy storage technologies (microbatteries, supercapacitors, fuel cells)

**Literature**

- Folienskript "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


**3.248 Course: Microstructure-Property-Relationships [T-MACH-110931]**





**Responsible:** Dr. Patric Gruber  
Prof. Dr. Christoph Kirchlechner

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	2

Events					
WT 24/25	2177020	<a href="#">Microstructure-Property-Relationships</a>	3 SWS	Lecture / 	Kirchlechner, Avadanii, Bansal, Vrellou, Gruber
Exams					
WT 24/25	76-T-MACH-110931	<a href="#">Microstructure-Property-Relationships</a>	Kirchlechner, Gruber		
ST 2025	76-T-MACH-110931	<a href="#">Microstructure-Property-Relationships</a>	Gruber, Kirchlechner		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Oral examination (about 30 min)

**Prerequisites**

The successful participation in Exercises for Microstructure-Properties-Relationships is the condition for the admittance to the oral exam in Microstructure-Properties-Relationships.

T-MACH-107683 - Übungen zu Gefüge-Eigenschafts-Beziehungen has not been started.

T-MACH-107604 - Gefüge-Eigenschafts-Beziehungen has not been started.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-110930 - Exercises for Microstructure-Property-Relationships](#) must have been passed.

**Workload**

120 hours

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

## V

**Microstructure-Property-Relationships**

2177020, WS 24/25, 3 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**

**Content**

The following microstructure-property-relationships will be discussed for all material classes:

- Elasticity and plasticity
- Fracture mechanics
- Fatigue
- Creep
- Electrical conductivity: Metallic conductors, semiconductors, superconductors, conductive polymers
- Magnetic properties und materials

In addition to the phenomenological description and physical explanation of the material properties an overview on the corresponding experimental techniques will be given.

The students fundamentally understand the interrelation between the microstructure and the properties of a material. This interrelation will be elaborated for mechanical properties (elasticity, plasticity, fracture, fatigue, creep) as well as functional properties (conductivity, magnetic properties) for all material classes, respectively. The students are able to phenomenological describe the material properties, to explain the underlying physical mechanisms and to understand how the properties can be specifically modified by the microstructure of the material. In the other way they are able to deduce the mechanical and functional properties of a material on the basis of its microstructure.

oral exam ca. 30 minutes

**3.249 Course: Microsystem Simulation [T-MACH-108383]**

**Responsible:** Prof. Dr. Jan Gerrit Korvink  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	1

**Competence Certificate**

written exam

**Prerequisites**

none

**Workload**

120 hours




## T





**3.250 Course: Mobile Machines [T-MACH-105168]**

**Responsible:** Prof. Dr.-Ing. Marcus Geimer  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	8	Grade to a third	Each summer term	2

Events					
ST 2025	2114073	<a href="#">Mobile Machines</a>	4 SWS	Lecture / 	Geimer, Kazenwadel
Exams					
WT 24/25	76T-MACH-105168	<a href="#">Mobile Machines</a>			Geimer
ST 2025	76-T-MACH-105168	<a href="#">Mobile Machines</a>			Geimer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

The assessment consists of an oral exam (45 min) taking place in the recess period. The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

**Prerequisites**

none

**Recommendation**

Knowledge in Fluid Power Systems is required. It is recommended to attend the course *Fluid Power Systems* [2114093] beforehand.

**Annotation****Learning objectives:**

After successful participation in the course:

- the student will be able to name the wide range of mobile machinery
- know the possible applications and operating sequences of the most important mobile machines
- be able to describe selected subsystems and components

Content:

- Presentation of the components used and the most important mobile machines
- Basics and structure of the machines
- Practical insights into the development of the machines

Media:

Downloadable set of slides for the lecture

Book "Grundlagen mobiler Arbeitsmaschinen", Karlsruhe series of publications on vehicle systems technology, Volume 22, KIT Scientific Publishing

**Workload**

240 hours

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

## V

**Mobile Machines**

2114073, SS 2025, 4 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
On-Site

**Content**

- Introduction of the required components and machines
- Basics of the structure of the whole system
- Practical insight in the development techniques

Knowledge in Fluid Power is required.

**Recommendations:**


It is recommended to attend the course *Fluid Power Systems* [2114093] beforehand.





- regular attendance: 42 hours
- self-study: 184 hours

## T

**3.251 Course: Model Reduction Methods for Modeling and Simulation of Reacting Flows [T-MACH-114060]****Responsible:** Dr. Viatcheslav Bykov**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2166540	<a href="#">Reduction methods for the modeling and the simulation of combustion processes</a>	2 SWS	Lecture / 	Bykov
Exams					
WT 24/25	76T-MACH-114060	<a href="#">Model Reduction Methods for Modeling and Simulation of Reacting Flows</a>			Bykov
ST 2025	76T-MACH-114060	<a href="#">Model Reduction Methods for Modeling and Simulation of Reacting Flows</a>			Bykov

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral exam, approx. 20 min

**Prerequisites**

T-MACH-114061 and T-MACH-105421 must not be started

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-114061 - Model Reduction Methods for Modeling and Simulation of Reacting Flows](#) must not have been started.

**Workload**

120 hours

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

## V

**Reduction methods for the modeling and the simulation of combustion processes****Lecture (V)  
On-Site**2166540, SS 2025, 2 SWS, Language: German/English, [Open in study portal](#)**Content**

The course concerns the problem of model reduction to save CPU time for integrations and simulations of chemical kinetic models of reacting flows. The principles of model reduction will be outlined. The basic mathematical concepts and methods of analysis of chemical reaction mechanisms will be introduced. The framework and detailed implementation scheme of model reduction will be introduced. The course will cover simplified and idealized models and examples in system biology of biochemical as well as combustion processes. These will be introduced, analyzed and reduced. The theoretical and numerical tools will be combined, implemented and illustrated by using these simple examples.

**Organizational issues**


Termin: Mi, 14:00-15:30. Für Änderungen siehe Aushang im ITT-Schaukasten und auf der Internetseite des Instituts.





**Literature**

N. Peters, B. Rogg: Reduced kinetic mechanisms for application in combustion systems, Lecture notes in physics, 15, Springer Verlag, 1993.

**T****3.252 Course: Model Reduction Methods for Modeling and Simulation of Reacting Flows [T-MACH-114061]****Responsible:** Dr. Viatcheslav Bykov**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2166540	<a href="#">Reduction methods for the modeling and the simulation of combustion processes</a>	2 SWS	Lecture / 	Bykov
Exams					
ST 2025	76T-MACH-114061	<a href="#">Model Reduction Methods for Modeling and Simulation of Reacting Flows</a>			Bykov

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral exam, approx. 20 min

**Prerequisites**

T-MACH-114060 and T-MACH-105421 must not be started

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-114060 - Model Reduction Methods for Modeling and Simulation of Reacting Flows](#) must not have been started.

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Reduction methods for the modeling and the simulation of combustion processes****Lecture (V)  
On-Site**2166540, SS 2025, 2 SWS, Language: German/English, [Open in study portal](#)**Content**

The course concerns the problem of model reduction to save CPU time for integrations and simulations of chemical kinetic models of reacting flows. The principles of model reduction will be outlined. The basic mathematical concepts and methods of analysis of chemical reaction mechanisms will be introduced. The framework and detailed implementation scheme of model reduction will be introduced. The course will cover simplified and idealized models and examples in system biology of biochemical as well as combustion processes. These will be introduced, analyzed and reduced. The theoretical and numerical tools will be combined, implemented and illustrated by using these simple examples.

**Organizational issues**

Termin: Mi, 14:00-15:30. Für Änderungen siehe Aushang im ITT-Schaukasten und auf der Internetseite des Instituts.

**Literature**

N. Peters, B. Rogg: Reduced kinetic mechanisms for application in combustion systems, Lecture notes in physics, 15, Springer Verlag, 1993.

## T

**3.253 Course: Modeling and Simulation [T-MACH-105297]**



**Responsible:** Prof. Dr.-Ing. Kai Furmans  
 Prof. Dr.-Ing. Marcus Geimer  
 Prof. Dr.-Ing. Luise Kärger



**Organisation:** KIT Department of Mechanical Engineering

Institute of Thermal Turbomachinery

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	7	Grade to a third	Each winter term	2

Events					
WT 24/25	2185227	<a href="#">Modelling and Simulation</a>	2 SWS	Lecture / 	Proppe, Furmans, Geimer, Kärger
WT 24/25	2185228	<a href="#">Modeling and Simulation</a>	2 SWS	Practice / 	Proppe, Furmans, Kärger, Geimer, Höllig
Exams					
WT 24/25	76-T-MACH-105297	<a href="#">Modeling and Simulation</a>			Furmans, Geimer, Kärger, Proppe
ST 2025	76-T-MACH-105297	<a href="#">Modeling and Simulation</a>			Geimer, Furmans, Kärger

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

The assessment consists of a 180 minutes written examination.

**Prerequisites**

none

**Annotation**

Last held in winter semester 24/25. From winter semester 25/26, this course will no longer be offered. It will be replaced by two new courses, one of which (Numerical Methods for Engineering Applications, 4 CP, starting summer semester 25) will always be offered in the summer semester and a second course (3 CP) will always be offered in the winter semester.

**Workload**

210 hours

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

## V

**Modelling and Simulation**

2185227, WS 24/25, 2 SWS, Language: German/English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

Introduction: Overview, concept formation, simulation studies, time/event-discrete models, event-oriented/process orientated/transaction-oriented view, typical model classes (operation/maintenance, storekeeping, loss-susceptible systems)

Time-continuous models with concentrated parameters, model characteristics and model analysis Numerical treatment of ordinary differential equations and differential-algebraic sets of equations coupled simulations with concentrated parameters

Time-continuous models with distributed parameters, description of systems by means of partial differential equations, model reduction, numerical solution procedures for partial differential equations (FDM, FEM, FVM)

**Organizational issues**

Wichtiger Hinweis: die Veranstaltung findet in geraden Wintersemestern (z.B. WS2024/25) auf Englisch, in ungeraden Wintersemestern (z.B. WS2023/24) auf Deutsch statt. Die Klausur ist zweisprachig.

Letzte Durchführung im Wintersemester 24/25. Ab Wintersemester 25/26 wird diese Teilleistung nicht mehr angeboten. Sie wird durch zwei neue Teilleistungen ersetzt werden, von denen eine (Numerische Methoden für Ingenieur Anwendungen, 4 LP, ab Sommersemester 25) immer im Sommersemester und eine zweite Veranstaltung (3 LP) immer im Wintersemester angeboten wird.

Important note: in even winter semesters (e.g. WS2024/25) the course is held in English language, in odd winter semesters (e.g. WS2023/24) in German language. The exam is bilingual.

Last held in winter semester 24/25. From winter semester 25/26, this course will no longer be offered. It will be replaced by two new courses, one of which (Numerical Methods for Engineering Applications, 4 CP, starting summer semester 25) will always be offered in the summer semester and a second course (3 CP) will always be offered in the winter semester.

**Literature**

Keine.

**3.254 Course: Modeling of Thermodynamical Processes [T-MACH-105396]**

**Responsible:** Prof. Dr. Ulrich Maas  
Dr.-Ing. Robert Schießl

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 24/25	2167523	<a href="#">Modeling of Thermodynamical Processes</a>	3 SWS	Lecture /	Schießl
Exams					
WT 24/25	76-T-MACH-105396	<a href="#">Modeling of Thermodynamical Processes</a>			Maas
ST 2025	76-T-MACH-105396	<a href="#">Modeling of Thermodynamical Processes</a>			Maas

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Oral exam, approx. 30 min

**Prerequisites**

none

**Workload**

180 hours

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

**Modeling of Thermodynamical Processes**

2167523, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

Principles of modelling: Representation of physical systems by equations

Numerical solution strategies for nonlinear equation systems

Constrained Optimization

Ordinary and partial differential equations

Application to various problems in thermodynamics (engine processes, determination of equilibrium states, unsteady processes in inhomogeneous systems)

**Literature**

Vorlesungsskript

Numerical Recipes C, FORTRAN; Cambridge University Press

R.W. Hamming; Numerical Methods for scientists and engineers; Dover Books On Engineering; 2nd edition; 1973





J. Kopitz, W. Polifke; Wärmeübertragung; Pearson Studium; 1. Auflage

T

**3.255 Course: Modeling of Turbulent Flows - RANS and LES [T-BGU-110842]****Responsible:** Prof. Dr.-Ing. Markus Uhlmann**Organisation:** KIT Department of Civil Engineering, Geo and Environmental Sciences**Part of:** [M-MACH-105405 - Courses of the KIT Department of Civil Engineering, Geo and Environmental Sciences](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6221911	<a href="#">Modelling of Turbulent Flows - RANS and LES</a>	4 SWS	Lecture / Practice ( / )	Uhlmann
Exams					
WT 24/25	8244110842	<a href="#">Modeling of Turbulent Flows - RANS and LES</a>			Uhlmann

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 45 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**Workload**

180 hours



## T

**3.256 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)



**Type**  
Written examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
5

Events					
WT 24/25	2183703	<a href="#">Numerical methods and simulation techniques</a>	3 SWS	Lecture / Practice ( /  )	Nestler, August, Prahs, Koeppel
ST 2025	2183703	<a href="#">Modelling and Simulation</a>		Lecture / Practice ( /  )	Nestler, August, Prahs
Exams					
WT 24/25	76-T-MACH-100300	<a href="#">Modelling and Simulation</a>			Nestler, August, Prahs

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

Successful participation in the computer internship (ungraded) and written exam, 90 min (graded)

### Prerequisites

none

### Recommendation

preliminary knowledge in mathematics, physics and materials science

### Workload

120 hours

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

## V

**Numerical methods and simulation techniques**

2183703, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)**  
**On-Site**

### 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

The student can

- explain the basic algorithms and numerical methods which are beside other applications relevant for materials simulations.
- describe and apply numerical solution methods for partial differential equations and dynamical systems
- apply numerical methods to solve heat and mass diffusion problems which can also be used to model microstructure formation processes
- has experiences in how to implement and program the introduced numerical methods from an integrated computer lab.

preliminary knowledge in mathematics, physics and materials science recommended

regular attendance: 22,5 hours lecture, 11,5 hours exercises

self-study: 116 hours

We regularly hand out exercise sheets. In addition, the course will be accompanied by practical exercises at the computer.

written examination: 90 minutes

### Organizational issues

Achtung: RAUMÄNDERUNG im Vergleich zum Vorlesungsverzeichnis! Der aktuelle Raum für die Vorlesung ist 311, Gebäude E, Moltkestr. 30 in Karlsruhe

Genaue Termine der Vorlesung:

22.10.2024 11:30 – 13:00  
 29.10.2024 11:30 - 13:00  
 05.11.2024 11:30 - 13:00  
 12.11.2024 11:30 - 13:00  
 19.11.2024 11:30 - 13:00  
 26.11.2024 11:30 - 13:00  
 03.12.2024 11:30 - 13:00  
 10.12.2024 11:30 - 13:00  
 17.12.2024 11:30 - 13:00  
 07.01.2025 11:30 - 13:00  
 14.01.2025 11:30 - 13:00  
 21.01.2024 11:30 - 13:00

Im Gegensatz zu Angaben im Vorlesungsverzeichnis finden dienstags 13:15 - 14:00 KEINE Vorlesungssitzungen statt.

Genaue Termine des Computerpraktikums in PRÄSENZ an ausgewählten Montagen 17:30-20:00 (in Geb. 20.21 Pool C)

11.11.2024  
 25.11.2024  
 09.12.2024  
 16.12.2024  
 20.01.2025

Im Gegensatz zu Angaben im Vorlesungsverzeichnis gibt es nur fünf Computerpraktikumstermine.

### Literature

1. Scientific Computing, G. Golub and J.M. Ortega (B.G.Teubner Stuttgart 1996)



### Modelling and Simulation

2183703, SS 2025, SWS, Language: German, [Open in study portal](#)

Lecture / Practice (VÜ)  
On-Site

**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

The student can

- explain the basic algorithms and numerical methods which are beside other applications relevant for materials simulations.
- describe and apply numerical solution methods for partial differential equations and dynamical systems
- apply numerical methods to solve heat and mass diffusion problems which can also be used to model microstructure formation processes
- has experiences in how to implement and program the introduced numerical methods from an integrated computer lab.

preliminary knowledge in mathematics, physics and materials science recommended

regular attendance: 22,5 hours lecture, 11,5 hours exercises

self-study: 116 hours

We regularly hand out exercise sheets. In addition, the course will be accompanied by practical exercises at the computer.

written examination: 90 minutes

**Organizational issues**

Die Termine für die Vorlesungen und für das Praktikum werden im ILIAS bekannt gegeben.

**Literature**

1. Scientific Computing, G. Golub and J.M. Ortega (B.G.Teubner Stuttgart 1996)

**3.257 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Oral examination

**Credits**  
5

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
3

Events					
WT 24/25	2183702	<a href="#">Modelling of Microstructures</a>	3 SWS	Lecture / Practice ( /  )	August, Prahs, Nestler, Koeppe
Exams					
WT 24/25	76-T-MACH-105303	<a href="#">Modelling of Microstructures</a>			August, Weygand, Nestler

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam 30 min

**Prerequisites**

none

**Recommendation**

materials science  
fundamental mathematics

**Workload**

120 hours

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

**Modelling of Microstructures**

2183702, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)**  
**On-Site**

**Content**

- Brief Introduction in thermodynamics
- Gibbs free energy and phase diagrams
- Free energy functional
- Phasefield equation
- Driving forces
- Grand chemical potential functional and the evolution equations
- Numeric solution of the phasefield equation

**The student can**

- explain the thermodynamic and statistical foundations for liquid-solid and solid-solid phase transition processes and apply them to construct phase diagrams.
- explain the mechanisms of phase boundary motion induced under driving forces
- use the phase-field method for simulation of microstructure formation processes
- have experiences in computing and conduction simulations of microstructure formation from an integrated computer lab.

Knowledge in materials science and in fundamental mathematics recommended

regular attendance: 22,5 hours lecture, 11,5 hours exercises

self-study: 116 hours

oral exam ca. 30 min

**Organizational issues**

Terminvereinbarung für die mündliche Prüfung: Sobald Sie wissen, wann Sie die Prüfung ablegen möchten, schreiben Sie bitte eine Mail an die Prüferin Anastasia August (anastasia.august2@kit.de) und schlagen Sie einen oder mehrere Termin/e vor. Die Prüfung dauert ca. 30 Minuten.

**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


**T****3.258 Course: Modern Control Concepts I [T-MACH-105539]**





**Responsible:** apl. Prof. Dr. Lutz Groell  
apl. Prof. Dr. Jörg Matthes

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2105024	<a href="#">Modern Control Concepts I</a>	2 SWS	Lecture / 	Matthes, Groell
Exams					
WT 24/25	76-T-MACH-105539	<a href="#">Modern Control Concepts I</a>	Matthes		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Written exam (Duration: 1 h)

**Prerequisites**

none

**Workload**

120 hours

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

**V****Modern Control Concepts I**

2105024, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**

**Literature**

- Åström, K.-J., Murray, R.M.: Feedback Systems, 2012
- Rugh, W.: Linear System Theory. Prentice Hall, 1996

**3.259 Course: Motor Vehicle Labor [T-MACH-105222]****Responsible:** Dr.-Ing. Michael Frey**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Completed coursework**Credits**  
4**Grading scale**  
pass/fail**Recurrence**  
Each term**Version**  
4

Events					
WT 24/25	2115808	<a href="#">Motor Vehicle Laboratory</a>	2 SWS	Practical course /	Frey
ST 2025	2114833	<a href="#">Motor Vehicle Labor</a>	2 SWS	Practical course /	Frey
ST 2025	2115808	<a href="#">Motor Vehicle Laboratory</a>	2 SWS	Practical course /	Frey
Exams					
WT 24/25	76-T-MACH-105222	<a href="#">Motor Vehicle Laboratory</a>	Frey, Unrau		
ST 2025	76-T-MACH-105222	<a href="#">Motor Vehicle Labor</a>	Frey		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Colloquium before each experiment

After completion of the experiments: written examination

Duration: 90 minutes

Auxiliary means: none

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***Motor Vehicle Laboratory**2115808, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Practical course (P)**  
**On-Site****Content**

1. Determination of the driving resistances of a passenger vehicle on a roller dynamometer; measurement of the engine performance of the test vehicle
2. Investigation of a twin-tube and a single-tube shock absorber
3. Behavior of car tyres under longitudinal forces and lateral forces
4. Investigation of acoustic behaviour of vehicles
5. Rolling resistance, energy dissipation and high-speed strength of car tires
6. Investigation of the moment transient characteristic of a Visco clutch

**Learning Objectives:**

The students have deepened their knowledge on motor vehicles acquired in lectures and can apply it practically. They have an overview of the applied measuring technique and can execute and analyse measurements for the handling of given problem definitions. They are ready to analyze and to judge measurement results.

**Organizational issues**

Genaue Termine und weitere Hinweise: siehe Institutshomepage.

Einteilung:

Gruppe A: Mo 14:00-15:30

Gruppe B: Mo 16:00-17:30

Gruppe C: Di 09:00-10:30

Gruppe D: Di 11:00-12:30

Gruppe E: Di 14:00-15:30

Gruppe F: Di 16:00-17:30

**Literature**

1. Matschinsky, W: Radführungen der Straßenfahrzeuge, Verlag TÜV Rheinland, 1998

2. Reimpell, J.: Fahrwerktechnik: Fahrzeugmechanik, Vogel Verlag, 1992

3. Gnadler, R.: Versuchsunterlagen zum Kraftfahrzeuglaboratorium

**Motor Vehicle Labor**

2114833, SS 2025, 2 SWS, [Open in study portal](#)

**Practical course (P)  
On-Site**

**Content**

1. Determination of the driving resistances of a passenger vehicle on a roller dynamometer; measurement of the engine performance of the test vehicle
2. Investigation of a twin-tube and a single-tube shock absorber
3. Behavior of car tyres under longitudinal forces and lateral forces
4. Behavior of car tires on wet road surface
5. Rolling resistance, energy dissipation and high-speed strength of car tires
6. Investigation of the moment transient characteristic of a Visco clutch

**Learning Objectives:**

The students have deepened their knowledge on motor vehicles acquired in lectures and can apply it practically. They have an overview of the applied measuring technique and can execute and analyse measurements for the handling of given problem definitions. They are ready to analyze and to judge measurement results.

**Organizational issues**

For the exact location and dates as well as further information, see the Institute homepage.

Division into

- Group A: Mon 14:00 - 15:30

- Group B: Mon 16:00 - 17:30

- Group C: Tue 09:00 - 10:30

- Group D: Tue 11:00 - 12:30

- Group E: Tue 14:00 - 15:30

- Group F: Tue 16:00 - 17:30

**Motor Vehicle Laboratory**

2115808, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Practical course (P)  
On-Site**



**Content**

1. Determination of the driving resistances of a passenger vehicle on a roller dynamometer; measurement of the engine performance of the test vehicle
2. Investigation of a twin-tube and a single-tube shock absorber
3. Behavior of car tyres under longitudinal forces and lateral forces
4. Behavior of car tires on wet road surface
5. Rolling resistance, energy dissipation and high-speed strength of car tires
6. Investigation of the moment transient characteristic of a Visco clutch

**Learning Objectives:**

The students have deepened their knowledge on motor vehicles acquired in lectures and can apply it practically. They have an overview of the applied measuring technique and can execute and analyse measurements for the handling of given problem definitions. They are ready to analyze and to judge measurement results.

**Organizational issues**

Genauer Ort und Termine sowie weitere Infos siehe Institutshomepage.

**Einteilung in**

- Gruppe A: Mo 14:00 - 15:30
- Gruppe B: Mo 16:00 - 17:30
- Gruppe C: Di 09:00 - 10:30
- Gruppe D: Di 11:00 - 12:30
- Gruppe E: Di 14:00 - 15:30
- Gruppe F: Di 16:00 - 17:30

**Literature**

1. Matschinsky, W: Radführungen der Straßenfahrzeuge, Verlag TÜV Rheinland, 1998
2. Reimpell, J.: Fahrwerktechnik: Fahrzeugmechanik, Vogel Verlag, 1992
3. Gnadler, R.: Versuchsunterlagen zum Kraftfahrzeuglaboratorium

**3.260 Course: Multi-Scale Plasticity [T-MACH-105516]**

**Responsible:** Prof. Dr. Christian Greiner  
PD Dr.-Ing. Katrin Schulz

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
3

Events					
WT 24/25	2181750	<a href="#">Multi-scale Plasticity</a>	2 SWS	Lecture /	Greiner, Schulz
Exams					
WT 24/25	76-T-MACH-105516	<a href="#">Multi-Scale Plasticity</a>			Schulz, Greiner

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam, about 30 min

**Prerequisites**

none

**Recommendation**

preliminary knowledge in mathematics, physics, mechanics and materials science

**Annotation**

- limited number of participants
- mandatory registration
- mandatory attendance

**Workload**

120 hours

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

**Multi-scale Plasticity**

2181750, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

This module will attempt to provide an overview to complex subjects in the field of material mechanics. For this purpose important scientific papers will be presented and discussed.

This will be done by having students read and critique one paper each week in a short review. In addition, each week will include presentation from one of the participants which aim to advocate or criticise each piece of work using the short reviews. He will also be the discussion leader, while students discuss the content, ideas, evaluation and open research questions of the paper. Using a professional conference management system (HotCRP), the student assume the role of reviewers and gain insight into the work of researchers.

The student

- can explain the physical foundations of plasticity as well as results of latest research.
- can independently read and evaluate scientific research papers.
- can present specific, technical information in structured, precise, and readable manner.
- is able to argue for and/or against a particular approach or idea using the knowledge acquired within the lecture.

preliminary knowledge in mathematics, physics, mechanics and materials science recommended

regular attendance: 22,5 hours

self-study: 97,5 hours

Exam: presentation (40%), oral examination (30 min, 60%)

The maximum number of students is 14 per semester.

**Organizational issues**





Blockveranstaltung in 5 Blöcken, Termine und Ort werden bekannt gegeben.

Anmeldung per Email an [katrin.schulz@kit.edu](mailto:katrin.schulz@kit.edu) bis zum 29.09.2024

**T****3.261 Course: NMR Micro Probe Hardware Conception and Construction [T-MACH-108407]****Responsible:** Prof. Dr. Jan Gerrit Korvink**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each summer term	1

Events					
ST 2025	2142551	<a href="#">NMR micro probe hardware conception and construction</a>	2 SWS	Practical course / 	Korvink, Jouda

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Successful participation.

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****NMR micro probe hardware conception and construction**2142551, SS 2025, 2 SWS, Language: English, [Open in study portal](#)**Practical course (P)  
Blended (On-Site/Online)****Content**

In order to prepare attendees, the following chapters will be offered, spread over the week as lecture units, and accompanying the practical work:

- Theory of magnetic resonance imaging
- The MRI probe and the principle of reciprocity
- RF resonators
- Coaxial cables and cable traps
- Tuning and matching the MRI probe
- Effects of material susceptibility
- The mechanical support of the MRI probe
- Introduction to ParaVision, the MRI imaging software.

**Organizational issues**Blockveranstaltung am CN, Bau 301, Raum 322, Anmeldung an [Mazin.Jouda@kit.edu](mailto:Mazin.Jouda@kit.edu)

## T

**3.262 Course: Nonlinear Continuum Mechanics [T-MACH-111026]****Responsible:** Prof. Dr.-Ing. Thomas Böhlke**Organisation:****Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each summer term	2

Events					
ST 2025	2162344	<a href="#">Nonlinear Continuum Mechanics</a>	4 SWS	Lecture / 🗎	Böhlke
Exams					
WT 24/25	76-T-MACH-111026	<a href="#">Nonlinear Continuum Mechanics</a>			Böhlke

Legend: 🗎 Online, 🗎 Blended (On-Site/Online), 🗎 On-Site, x Cancelled

**Competence Certificate**

oral examination (approx. 25 min)

**Prerequisites**

Passing the "Tutorial Nonlinear Continuum Mechanics" (T-MACH-111027) is a prerequisite for taking part in the exam.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-111027 - Tutorial Nonlinear Continuum Mechanics](#) must have been passed.

**Workload**

180 hours

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

## V

**Nonlinear Continuum Mechanics**2162344, SS 2025, 4 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

- tensor calculus, kinematics, balance equations
- principles of material theory
- finite elasticity
- infinitesimal elasto(visco)plasticity
- exact solutions of infinitesimal plasticity
- finite elasto(visco)plasticity
- infinitesimal and finite crystal(visco)plasticity
- hardening and failure
- strain localization

**Organizational issues**

Mit Zustimmung aller Teilnehmenden kann die Lehrveranstaltung auch auf Deutsch gehalten werden.

**Literature**

- Vorlesungsskript / 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 1997.
- Wriggers, P.: Nichtlineare Finite-Element-Methoden. Springer 2001.
- Wriggers, P.: Nonlinear Finite Element Methods. Springer 2008.

## T

**3.263 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Written examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
4

Events					
WT 24/25	2141865	<a href="#">Novel actuators and sensors</a>	2 SWS	Lecture / 	Kohl, Sommer
Exams					
WT 24/25	76-T-MACH-102152	<a href="#">Novel Actuators and Sensors</a>			Kohl, Sommer
ST 2025	7600010	<a href="#">Novel Actuators and Sensors</a>			Kohl
ST 2025	76-T-MACH-102152	<a href="#">Novel Actuators and Sensors</a>			Sommer, Kohl

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 60 minutes

**Prerequisites**

T-MACH-114036 must not be started

**Workload**

120 hours

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

## V

**Novel actuators and sensors**

2141865, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**





**Literature**

- Vorlesungsskript "Neue Aktoren" und Folienskript "Sensoren"
- 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

**3.264 Course: Nuclear Fusion Technology [T-MACH-110331]****Responsible:** Dr. Aurelian Florin Badea**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Expansion**  
1 terms**Version**  
1

Events					
WT 24/25	2189920	<a href="#">Nuclear Fusion Technology</a>	2 SWS	Lecture / 	Badea
Exams					
WT 24/25	76-T-MACH-110331	<a href="#">Nuclear Fusion Technology</a>			Badea

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, approx. 20 min.

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Nuclear Fusion Technology**2189920, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**


This lecture is dedicated to Master students of mechanical engineering and other engineering studies. Goal of the lecture is the understanding of the physics of fusion, the components of a fusion reactor and their functions. The technological requirements for using fusion technology for future commercial production of electricity and the related environmental impact are also addressed. The students are capable of giving technical assessment of the usage of the fusion energy with respect to its safety and sustainability. The students are qualified for further training in fusion energy field and for research-related professional activity.





- nuclear fission & fusion
- neutronics for fusion
- fuel cycles, cross sections
- gravitational, magnetic and inertial confinement
- fusion experimental devices
- energy balance for fusion systems; Lawson criterion and Q-factor
- materials for fusion reactors
- plasma physics, confinement
- plasma heating
- timeline of the fusion technology
- ITER, DEMO
- safety and waste management

## T

**3.265 Course: Nuclear Power and Reactor Technology [T-MACH-110332]****Responsible:** Dr. Aurelian Florin Badea**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Expansion	Version
Oral examination	4	Grade to a third	1 terms	1

Events					
WT 24/25	2189921	<a href="#">Nuclear Power and Reactor Technology</a>	3 SWS	Lecture / 	Badea
Exams					
WT 24/25	76-T-MACH-110332	<a href="#">Nuclear Power and Reactor Technology</a>	Badea		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, approx. 20 min.

**Prerequisites**

None

**Workload**

120 hours

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

## V

**Nuclear Power and Reactor Technology**2189921, WS 24/25, 3 SWS, Language: English, [Open in study portal](#)**Lecture (V)  
On-Site****Content**

This lecture is dedicated to Master students of mechanical engineering and other engineering studies. Goal of the lecture is the understanding of reactor technology and of the major physical processes in converting nuclear power into electrical energy. The students acquire comprehensive knowledge on the physics of nuclear fission reactors: neutron flux, cross sections, fission, breeding processes, chain reaction, critical size of a nuclear system, moderation, reactor dynamics, transport- and diffusion-equation for the neutron flux distribution, power density distributions in reactor, one-group, two-group and multi-group theories for the neutron spectrum. Students are able to analyze and understand the obtained results. The students are capable of understanding the advantages and disadvantages of different reactor technologies - LWR, heavy water reactors, nuclear power systems of generation IV -by using the delivered knowledge on reactor physics, thermal-hydraulics, reactor design, control, safety and requirements of the front-end and back-end of the fuel cycle. The students are qualified for further training in nuclear energy and safety field and for (also research-related) professional activity in the nuclear industry.

- nuclear fission & fusion,
- radioactive decay, neutron excess, fission, fast and thermal neutrons, fissile and fertile nuclei, enrichment, neutron flux, cross section, reaction rate, mean free path,
- chain reaction, critical size, moderation,
- reactor dynamics,
- transport- and diffusion-equation for the neutron flux distribution,
- power distributions in reactor,
- one-group and two-group theories,
- light-water reactors,
- reactor safety,
- design of nuclear reactors,
- breeding processes,
- nuclear power systems of generation IV




**T****3.266 Course: Nuclear Power Plant Technology [T-MACH-105402]**





**Responsible:** Dr. Aurelian Florin Badea  
Prof. Dr.-Ing. Xu Cheng

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2170460	<a href="#">Nuclear Power Plant Technology</a>	2 SWS	Lecture / 	Cheng, Schulenberg
Exams					
ST 2025	76-T-MACH-105402	<a href="#">Nuclear Power Plant Technology</a>	Cheng, Schulenberg		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, Duration: approximately 30 minutes  
no tools or reference materials may be used during the exam

**Prerequisites**

none

**Workload**

120 hours

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

**V****Nuclear Power Plant Technology**

2170460, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

The training objective of the course is the qualification for a research-related professional activity in nuclear power plant engineering. The participants can describe the most important components of nuclear power plants and their function. You can design or modify nuclear power plants independently and creatively. They have acquired a broad knowledge of this power plant technology, including specific knowledge of core design, design of primary and secondary systems, and of nuclear safety technologies. Based on the acquired knowledge in thermodynamics and neutron physics, they can describe and analyze the specific behavior of the nuclear power plant components and assess risks. Participants of the lecture have a trained analytical thinking and judgment in the design of nuclear power plants.

**Power plants with pressurized water reactors:**

Design of the pressurized water reactor

- Fuel assemblies
- Control rods and drives
- Core instrumentation
- Reactor pressure vessel and its internals

Components of the primary system

- Primary coolant pumps
- Pressurizer
- Steam generator
- Water make-up system

Secondary system:

- Turbines
- Reheater
- Feedwater system
- Cooling systems

Containment

- Containment design
- Components of safety systems
- Components of residual heat removal systems

Control of a nuclear power plant with PWR

Power plants with boiling water reactors:

Design of the boiling water reactor

- Fuel assemblies
- Control elements and drives
- Reactor pressure vessel and its internals

Containment and components of safety systems

Control of a nuclear power plant with boiling water reactors

**Literature**

Vorlesungsmanuskript

## T

**3.267 Course: Numerical Fluid Mechanics [T-MACH-105338]**

**Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel  
Dr.-Ing. Davide Gatti

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Oral examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
4

Events					
WT 24/25	2153441	<a href="#">Numerical Fluid Mechanics</a>	4 SWS	Lecture / Practice ( /  )	Gatti
Exams					
WT 24/25	76T-Mach-105338	<a href="#">Numerical Fluid Mechanics</a>	Gatti, Frohnäpfel		
ST 2025	76-T-MACH-105338	<a href="#">Numerical Fluid Mechanics</a>	Gatti, Frohnäpfel		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

oral exam - 30 minutes

### Prerequisites

none

### Workload

120 hours

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

## V

**Numerical Fluid Mechanics**

2153441, WS 24/25, 4 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)**  
**Blended (On-Site/Online)**

### Content

The course covers the following topics:

1. basic equations of computational fluid dynamics
2. main discretization methods for fluid mechanics problems, with focus on finite differences and finite volumes
3. boundary and initial conditions
4. mesh generation and mesh treatment
6. solution algorithms for linear and nonlinear systems of equations
7. solution strategies for the incompressible Navier-Stokes equations
8. introduction to the solution of the compressible Navier-Stokes equations
9. examples of numerical simulation in practice

### Literature

Ferziger, Peric: Computational Methods for Fluid Dynamics. Springer-Verlag, 1999.

Hirsch: Numerical Computation of Internal and External Flows. John Wiley & Sons Inc., 1997.

Versteeg, Malalasekera: An introduction to computational fluid dynamics. The finite volume method. John Wiley & Sons Inc., 1995

**3.268 Course: Numerical Fluid Mechanics with PYTHON [T-MACH-110838]**

**Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel  
Dr.-Ing. Davide Gatti

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each summer term	1

Events					
ST 2025	2154405	<a href="#">Numerical Fluid Mechanics with Python</a>	2 SWS	Practical course /	Gatti
Exams					
WT 24/25	76-T-MACH-110838	<a href="#">Numerical Fluid Mechanics with Python</a>	Frohnäpfel, Gatti		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

ungraded homework

**Prerequisites**

none

**Workload**

120 hours

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

**Numerical Fluid Mechanics with Python**

2154405, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Practical course (P)**  
**Blended (On-Site/Online)**

**Content**

Numerical Fluid Mechanics with Python

- Introduction to Numerics and Matlab
- Finite-Difference-Method
- Finite-Volume-Method
- boundary conditions and initial conditions
- explicit and implicit schemes
- pressure correction
- Solving the Navier-Stokes equation numerically for 2D flow problems

**Organizational issues**

Bitte bis zum 26.07.24 per E-Mail anmelden [sekretariat@istm.kit.edu](mailto:sekretariat@istm.kit.edu).

**Literature**

H. Ferziger, M. Peric, *Numerische Strömungsmechanik*, Springer-Verlag, ISBN: 978-3-540-68228-8, 2008

E. Laurien, H. Oertel jr, *Numerische Strömungsmechanik*, Vieweg+Teubner Verlag, ISBN: 973-3-8348-0533-1, 2009

**T****3.269 Course: Numerical Mathematics for Students of Computer Science [T-MATH-102242]**

**Responsible:** Prof. Dr. Andreas Rieder  
 Dr. Daniel Weiß  
 Prof. Dr. Christian Wieners

**Organisation:** KIT Department of Mathematics

**Part of:** [M-MACH-104885 - Courses of the KIT Department of Mathematics](#)

**Type**  
 Written examination

**Credits**  
 4,5

**Grading scale**  
 Grade to a third

**Recurrence**  
 Each term

**Version**  
 4

Events					
ST 2025	0187400	<a href="#">Numerische Mathematik für die Fachrichtungen Informatik und Ingenieurwesen</a>	2 SWS	Lecture	Wieners
ST 2025	0187500	<a href="#">Übungen zu Numerische Mathematik für die Fachrichtungen Informatik und Ingenieurwesen</a>	1 SWS	Practice	Wieners
Exams					
WT 24/25	6700011	<a href="#">Numerical Mathematics for Students of Computer Science</a>			Weiß

**Prerequisites**

None

**3.270 Course: Numerical Simulation of Multi-Phase Flows [T-MACH-105420]****Responsible:** Dr. Martin Wörner**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2130934	<a href="#">Numerical Modeling of Multiphase Flows</a>	2 SWS	Lecture /	Wörner
Exams					
WT 24/25	76-T-MACH-105420	<a href="#">Numerical Simulation of Multi-Phase Flows</a>			Frohnapfel
ST 2025	76-T-MACH-105420	<a href="#">Numerical Simulation of Multi-Phase Flows</a>			Frohnapfel

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam 30 minutes

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***Numerical Modeling of Multiphase Flows**2130934, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

1. Introduction in the subject of multi-phase flows (terms and definitions, examples)
2. Physical fundamentals (dimensionless numbers, phenomenology of single bubbles, conditions at fluid interfaces, forces on a suspended particle)
3. Mathematical fundamentals (governing equations, averaging, closure problem)
4. Numerical fundamentals (discretization in space and time, truncation error and numerical diffusion)
5. Models for interpenetrating continua (homogeneous model, algebraic slip model, standard two-fluid model and its extensions)
6. Euler-Lagrange model (particle equation of motion, particle response time, one-/two-/four-way coupling)
7. Interface resolving methods (volume-of-fluid, level-set and front-capturing method)

**Organizational issues**

Mündliche Prüfung, Dauer: 30 Minuten, Hilfsmittel: keine

Oral examination (in German or English language), Duration: 30 minutes, Auxiliary means: none

**Literature**Ein englischsprachiges Kurzschriftum kann unter <https://publikationen.bibliothek.kit.edu/270056199> heruntergeladen werden.

Die Powerpoint-Folien werden nach jeder Vorlesung im ILIAS-System zum Herunterladen bereitgestellt.

Eine Liste mit Buchempfehlungen wird in der ersten Vorlesungsstunde ausgegeben.

**3.271 Course: Numerical Simulation of Turbulent Flows [T-MACH-105397]****Responsible:** Dr. Günther Grötzbach**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2153449	<a href="#">Numerical Simulation of Turbulent Flows</a>	3 SWS	Lecture /	Grötzbach
Exams					
WT 24/25	76-T-MACH-105397	<a href="#">Numerical Simulation of Turbulent Flows</a>			Grötzbach

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral

Duration: 30 minutes

no auxiliary means

**Prerequisites**

none

**Recommendation**

Basics in fluid mechanics

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***Numerical Simulation of Turbulent Flows**2153449, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

The students are qualified to describe the fundamentals of direct numerical simulation (DNS) and large eddy simulation (LES) of turbulent flows. They understand the principle differences between these simulation methods and the respective properties of the conventional turbulence modelling approaches basing on Reynolds Averaged Navier-Stokes equations (RANS). They can describe subgrid scale models, peculiarities of wall and inlet/outlet modelling, suitable numerical solution schemes and evaluation methods. They have obtained the knowledge and understanding required to identify the best modelling approach (among the available methods) for the problem at hand, thus being able to solve given thermal and fluid dynamical problems appropriately.

**The lecture series will introduce in following subjects of the turbulence simulation method:**

- Appearance of turbulence and deduction of requirements and limits of the simulation method.
- Conservation equations for flows with heat transfer, filtering them in time or space.
- Some subgrid scale models for small scale turbulence and their physical justification.
- Peculiarities in applying boundary and initial conditions.
- Suitable numerical schemes for integration in space and time.
- Statistical and graphical methods to analyse the simulation results.
- Application examples for turbulence simulations in research and engineering

**Organizational issues**

Dauer der Vorlesung 3 h von 14:00 - 15:30 h und von 15:45 - 16:30 h./Duration of the lecture 3 h from 14:00 - 15:30 h and from 15:45 - 16:30 h

**Literature**

J. Piquet, *Turbulent Flows – Models and Physics*, Springer, Berlin (2001)

J. Fröhlich, *Large Eddy Simulation turbulenter Strömungen*. Lehrbuch Maschinenbau, B.G. Teubner Verlag, Wiesbaden (2006)

P. Sagaut, C. Meneveau, *Large-eddy simulation for incompressible flows: An introduction*. Springer Verlag (2010)

G. Grötzbach, *Revisiting the Resolution Requirements for Turbulence Simulations in Nuclear Heat Transfer*. Nuclear Engineering & Design Vol. 241 (2011) pp. 4379-4390

G. Grötzbach, Script in English





### 3.272 Course: Organ Support Systems [T-MACH-105228]

**Responsible:** apl. Prof. Dr. Christian Pylatiuk

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2106008	<a href="#">Organ support systems</a>	2 SWS	Lecture /	Pylatiuk
Exams					
WT 24/25	76-T-MACH-105228	<a href="#">Organ Support Systems</a>			Pylatiuk

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

Written examination (Duration: 45min)

#### Prerequisites

none

#### Workload

120 hours

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



#### Organ support systems

2106008, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

##### Content:

- Introduction: Definitions and classification of organ support and replacement.
- Special topics: acoustic and visual prostheses, exoskeletons, neuroprostheses, tissue-engineering, hemodialysis, heart-lung machine, artificial hearts, biomaterials.

#### Learning objectives:

Students have fundamental knowledge about functionality of organ support systems and its components. An analysis of historical developments can be done and limitations of current systems can be found. The limits and possibilities of transplantations can be elaborated.

#### Organizational issues

Die Vorlesung findet in Präsenz statt.


#### Literature





- Jürgen Werner: Kooperative und autonome Systeme der Medizintechnik: Funktionswiederherstellung und Organersatz. Oldenbourg Verlag.
- Rüdiger Kramme: Medizintechnik: Verfahren - Systeme – Informationsverarbeitung. Springer Verlag.
- E. Wintermantel, Suk-Woo Ha: Medizintechnik. Springer Verlag.

**T****3.273 Course: Patent Law [T-INFO-101310]**

**Responsible:** Patric Werner  
**Organisation:** KIT Department of Informatics  
**Part of:** [M-MACH-104883 - Courses of the KIT Department of Informatics](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	3	Grade to a third	Each summer term	3

Events					
ST 2025	24656	<a href="#">Patent Law</a>	2 SWS	Lecture / 	Werner
Exams					
WT 24/25	7500006	<a href="#">Patent Law</a>			Sattler, Matz
ST 2025	7500109	<a href="#">Patent Law</a>			Sattler

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 60 minutes.

**Prerequisites**

None.

**Recommendation**

None.

## T


**3.274 Course: Phase Transformations in Materials [T-MACH-111391]**





**Responsible:** Prof. Dr.-Ing. Martin Heilmaier  
Dr.-Ing. Alexander Kauffmann

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	4	Grade to a third	Each winter term	1 terms	1

Events					
WT 24/25	2173421	<a href="#">Phase Transformations in Materials</a>	3 SWS	Lecture / 	Kauffmann, Heilmaier, Sen
Exams					
WT 24/25	76-T-MACH-111391	<a href="#">Phase Transformations in Materials</a>			Kauffmann
ST 2025	76-T-MACH-111391	<a href="#">Phase Transformations in Materials</a>			Kauffmann

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam (about 25 min.)

**Prerequisites**

none

**Recommendation**

Materials Science and Engineering I/II and some additional fundamentals on thermodynamics and diffusion or Materials Physics and Metals

**Workload**

120 hours

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

## V

**Phase Transformations in Materials**

2173421, WS 24/25, 3 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content***Learning objectives:*

Students are familiar with a generalized scheme of phase transformations important in materials science and engineering. This includes qualitative and quantitative description of thermodynamics and kinetics of phase transformations. The students are able to apply their fundamental knowledge in order to describe important phase transformations and to deduce properties of materials undergoing these transformations.

*Content:*

Ch. 0: General Information

Ch. 1: Thermodynamic and Kinetic Fundamentals

- Thermodynamics
- Kinetics
- Overview About Phase Transformations/Schemes

Ch. 2: Experimental Techniques

- General Terms
- Structural Investigations
- Physical Investigations
- Chemical Investigations
- Microstructural Investigations

Ch. 3: Single-Component Systems

- Solidification and Allotropic Transformations
  - Solidification of Elements
    - Nucleation
    - Homogeneous
    - Heterogeneous
    - Growth
      - Temperature-Time-Dependence
      - Facet Energies
      - Facet Growth
      - Heat Transfer (Thermal Dendrites)
  - Allotropic Transformations
    - Nucleation
      - Impact of Elastic Strain Energy
      - Interface Types
    - Growth
      - Temperature-Time-Dependence
- Continuous Phase Transitions

Ch. 4: Multi-Component Systems

- Reconstructive Transformation
  - Solidification of Solid Solutions
  - Spinodal Decomposition
  - Eutectic and Eutectoid Reactions
  - Peritectic and Peritectoid Reactions
  - Precipitation and Ageing
- Displacive Transformation
  - Intermediate Transformations
  - Order Transition
  - Massive Transformation

*Work Load*

lectures: 36 h

private studies: 64 h

**Organizational issues**

Details about the lecture are distributed via: <https://www.iam.kit.edu/wk/english/studies.php>

**Literature**

Powerpoint slides will be distributed via the ILIAS system.

Detailed information are available for different sub topics of the lecture from:

D. A. Porter, K. E. Easterling, M. Y. Sherif: "Phase transformations in metals and alloys", CRC Press (2009)

<https://services.bibliothek.kit.edu/primo/start.php?recordid=KITSRC27759961X>

H.K.D.H. Bhadeshia: "Diffusional formation of ferrite in iron and its alloys" in Progress in Materials Science 29 (1985) 321-386

[https://doi.org/10.1016/0079-6425\(85\)90004-0](https://doi.org/10.1016/0079-6425(85)90004-0) [currently not available from KIT network but maybe accessed by LEA]

H.K.D.H. Bhadeshia, R.W.K. Honeycomb: "Steels: microstructures and properties", Butterworth-Heinemann imprint by Elsevier (2017)

<https://services.bibliothek.kit.edu/primo/start.php?recordid=KITSRC518051110> [free online access from within KIT network]

H.K.D.H. Bhadeshia: "Bainite in steels: transformations, microstructure and properties", Institute of Materials, London (1992)

<https://services.bibliothek.kit.edu/primo/start.php?recordid=KITSRC030295610>

R.W. Cahn, P. Haasen (Editoren): „Physical Metallurgy“, Serie, North Holland und andere (1996)

<http://services.bibliothek.kit.edu/primo/start.php?recordid=KITSRC052463656>

J. Freudenberger: „Skript zur Vorlesung Physikalische Werkstoffeigenschaften“, IFW Dresden (2004)

<https://www.ifw-dresden.de/institutes/imw/events/lectures/lecture-notes/physikalische-werkstoffeigenschaften/> [public domain]

## T



## 3.275 Course: Photovoltaics [T-ETIT-101939]




**Responsible:** Prof. Dr.-Ing. Michael Powalla

**Organisation:** KIT Department of Electrical Engineering and Information Technology

**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each summer term	2

Events					
ST 2025	2313737	<a href="#">Photovoltaics</a>	3 SWS	Lecture / 	Powalla, Lemmer
ST 2025	2313738	<a href="#">Tutorial 2313737 Photovoltaik</a>	1 SWS	Practice / 	Powalla, Lemmer
Exams					
WT 24/25	7313737	<a href="#">Photovoltaics</a>			Powalla, Lemmer

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

### Prerequisites


"M-ETIT-100524 - Solar Energy" must not have started.





### Modeled Conditions

The following conditions have to be fulfilled:

1. The course [T-ETIT-100774 - Solar Energy](#) must not have been started.

**T****3.276 Course: Physical and Chemical Principles of Nuclear Energy in View of  
Reactor Accidents and Back-End of Nuclear Fuel Cycle [T-MACH-105537]****Responsible:** apl. Prof. Dr. Ron Dagan**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
3

Events					
WT 24/25	2189906	<a href="#">Physical and chemical principles of nuclear energy in view of reactor accidents and back-end of nuclear fuel cycle</a>	2 SWS	Lecture / 	Dagan, Metz
Exams					
WT 24/25	76-T-MACH-105537	<a href="#">Physical and Chemical Principles of Nuclear Energy in View of Reactor Accidents and Back-End of Nuclear Fuel Cycle</a>			Dagan
ST 2025	76-T-MACH-105537	<a href="#">Physical and Chemical Principles of Nuclear Energy in View of Reactor Accidents and Back-End of Nuclear Fuel Cycle</a>			Dagan

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, approx. 30 min.

**Prerequisites**

none

**Workload**

120 hours

*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)  
On-Site**2189906, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**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

**The students**

- understand the physical explanations of the known nuclear accidents
- can perform simplified calculations to demonstrate the accidents outcome.
- Define safety relevant properties of low/ intermediate / high level waste products
- Are able to evaluate principles and implications of reprocessing, storage and disposal options for nuclear waste.

Regular attendance: 14 h

self study 46 h

oral exam about 20 min.

**Literature**

AEA öffentliche Dokumentation zu den nukleare Ereignissen

K. Wirtz: Grundlagen der Reaktortechnik Teil I, II, Technische Hochschule Karlsruhe 1966

D. Emendorfer. K.H. Höcker: Theorie der Kernreaktoren, Teil I, II BI- Hochschultaschenbücher 1969

J. Duderstadt and L. Hamilton: Nuclear reactor Analysis, J. Wiley & Sons , Inc. 1975 (in Englisch)

R.C. Ewing: The nuclear fuel cycle: a role for mineralogy and geochemistry. Elements vol. 2, p.331-339, 2006 (in Englisch)

J. Bruno, R.C. Ewing: Spent nuclear fuel. Elements vol. 2, p.343-349, 2006 (in Englisch)



## T

**3.277 Course: Physical Basics of Laser Technology [T-MACH-102102]**

**Responsible:** Dr.-Ing. Johannes Schneider  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
5

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
5

Events					
WT 24/25	2181612	<a href="#">Physical basics of laser technology</a>	3 SWS	Lecture / Practice ( / )	Schneider
Exams					
WT 24/25	76-T-MACH-102102	<a href="#">Physical Basics of Laser Technology</a>	Schneider		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral examination (ca. 25-30 min)

no tools or reference materials

**Prerequisites**

It is not possible, to combine this brick with brick Laser Material Processing [T-MACH-112763], brick Laser Application in Automotive Engineering [T-MACH-105164] and brick Physical Basics of Laser Technology [T-MACH-109084].

**Recommendation**

Basic knowledge of physics, chemistry and material science

**Workload**

150 hours

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

## V

**Physical basics of laser technology**

2181612, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)**  
**On-Site**

**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.

- 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
- safety aspects

The lecture is complemented by a tutorial.

The student

- can explain the principles of light generation, the conditions for light amplification as well as the basic structure and function of different laser sources.
- can describe the influence of laser, material and process parameters for the most important methods of laser-based materials processing and choose laser sources suitable for specific applications.
- can illustrate the possible applications of laser sources in measurement and medicine technology
- can explain the requirements for safe handling of laser radiation and for the design of safe laser systems.

Basic knowledge of physics, chemistry and material science is assumed.

regular attendance: 33,5 hours

self-study: 116,5 hours

The assessment consists of an oral exam (ca. 30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation). The re-examination is offered upon agreement.

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.

**Organizational issues**

Termine für die Übung werden in der Vorlesung bekannt gegeben!

**Literature**

M. W. Sigrist: Laser: Theorie, Typen und Anwendungen, 2018, Springer Spektrum

T. Graf: Laser - Grundlagen der Laserstrahlerzeugung 2015, Springer Vieweg

R. Poprawe: Lasertechnik für die Fertigung, 2005, Springer

H. Hügel, T. Graf: Materialbearbeitung mit Laser, 2023, Springer Vieweg

J. Eichler, H.-J. Eichler: Lasers - Basics, Advances and Applications, 2018, Springer

W. T. Silfvast: Laser Fundamentals, 2008, Cambridge University Press


W. M. Steen: Laser Material Processing, 2010, Springer





R. Poprawe, et al.: Tailored Light 1 - High Power Lasers for Production, 2018, Springer

R. Poprawe, et al.: Tailored Light 2 - Laser Applications, 2024, Springer

## T

**3.278 Course: Plastic Electronics / Polymerelectronics [T-ETIT-100763]****Responsible:** Prof. Dr. Ulrich Lemmer**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2313709	<a href="#">Polymerelectronics/ Plastic Electronics</a>	2 SWS	Lecture / 	Hernandez Sosa
Exams					
WT 24/25	7313709	<a href="#">Plastic Electronics / Polymerelectronics</a>			Lemmer, Hernandez Sosa

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

The control of success takes place within the framework of an oral overall examination (approx. 30 minutes).

**Prerequisites**

none

**Recommendation**

Knowledge of semiconductor devices

**Annotation**

Lecture and examination are held in German or English, as required.

## T


**3.279 Course: Plasticity of Metals and Intermetallics [T-MACH-110818]**





**Responsible:** Prof. Dr.-Ing. Martin Heilmaier  
Dr.-Ing. Alexander Kauffmann

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	8	Grade to a third	Each summer term	1

Events					
ST 2025	2173648	<a href="#">Plasticity of Metals and Intermetallics</a>	4 SWS	Lecture / 	Kauffmann, Heilmaier, Schliephake
Exams					
WT 24/25	76-T-MACH-110818	<a href="#">Plasticity of Metals and Intermetallics</a>			Kauffmann, Heilmaier
ST 2025	76-T-MACH-110818	<a href="#">Plasticity of Metals and Intermetallics</a>			Kauffmann, Heilmaier

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam (about 25 minutes)

**Prerequisites**

T-MACH-110268 – Plastizität von metallischen und intermetallischen Werkstoffen has not been started

T-MACH-105301 - Werkstoffkunde III has not been started

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-105301 - Materials Science and Engineering III](#) must not have been started.

**Workload**

240 hours

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

## V

**Plasticity of Metals and Intermetallics**

2173648, SS 2025, 4 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content****Learning Objectives**

Students are familiar with macroscopic, mesoscopic and microscopic mechanisms of plastic deformation in metals, alloys and intermetallics including the qualitative and quantitative descriptions. Furthermore, students can apply their knowledge in order to deduce and explain mechanism-property relationships in this kind of materials and their use in materials manufacturing.

**Content**

Chapter overview

Ch. 0: General Information

Ch. 1: Relevance of Plasticity in Industry and Research

Ch. 2: Macroscopic Features of Plastic Deformation

Ch. 3: Fundamentals and Interrelations to other Lectures

- Fundamental Concepts of Elasticity
- Macroscopic Strength and Strengthening/Hardening
- Fundamentals of Crystallography
- Fundamentals of Defects in Crystalline Solids

Ch. 4: Dislocations

- Fundamental Concept
- Observation of Dislocations
- Properties of Dislocations
- Dislocations in fcc Metals
- Dislocations in bcc Metals
- Dislocations in hcp Metals and Complex Intermetallics

Ch. 5: Single Crystal Plasticity

- General Stages of Plastic Deformation and Fundamentals of the Stress-Strain curve (fcc Metals)
- Influence of Temperature, Orientation, Strain Rate, etc. (fcc Metals)
- Further Examples (Extension of the Results to bcc, hcp and Intermetallic Materials)
- Deformation Twinning

Ch. 6: Plasticity of Polycrystalline Materials

- Transition from Single Crystals to Polycrystals
- Strength of Polycrystals
  - Solute Atoms
  - Dislocations (incl. Dislocation Patterning)
  - Grain Boundaries (incl. Homogenization of Critical Stress)
  - Precipitates and Dispersoids

Ch. 7: Other Mechanisms of Plastic Deformation

**Work Load**

*lectures:* 56 h

*private studies:* 187 h

**Organizational issues**

Details about the lecture are distributed via: <https://www.iam.kit.edu/wk/english/studies.php>

**Literature**

Powerpoint slides will be distributed via the ILIAS system.

Detailed information are available for different sub topics of the lecture:

P. Hirth, J. Lothe: „Theory of Dislocations“, Krieger (1992)

<http://services.bibliothek.kit.edu/primos/start.php?recordid=KITSRC070938105>

D. Hull, D. J. Bacon: „Introduction to Dislocations“, Elsevier (2011)

<http://services.bibliothek.kit.edu/primos/start.php?recordid=KITSRC383083990> (free via KIT license)

R. W. Cahn, P. Haasen (Editoren): „Physical Metallurgy“, Serie, North Holland (1996)

<http://services.bibliothek.kit.edu/primos/start.php?recordid=KITSRC052463656>

J. Freudenberger: „Skript zur Vorlesung Physikalische Werkstoffeigenschaften“, IFW Dresden (2004)

<https://www.ifw-dresden.de/de/ifw-institutes/ikm/lectures/vorlesungsskript-physikalische-werkstoffeigenschaften> (public domain)

**3.280 Course: Polymer Engineering I [T-MACH-102137]****Responsible:** Dr.-Ing. Wilfried Liebig**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
2

Events					
WT 24/25	2173590	<a href="#">Polymer Engineering I</a>	2 SWS	Lecture /	Liebig
Exams					
WT 24/25	76-T-MACH-102137	<a href="#">Polymer Engineering I</a>			Liebig
ST 2025	76-T-MACH-102137	<a href="#">Polymer Engineering I</a>			Liebig

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Oral exam, about 25 minutes

**Prerequisites**

T-MACH-114007 must not have been started

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***Polymer Engineering I**2173590, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

1. Economical aspects of polymers
2. Introduction of mechanical, chemical and electrical properties
3. Processing of polymers (introduction)
4. Material science of polymers
5. Synthesis

**learning objectives:**

The field of Polymer Engineering includes synthesis, material science, processing, construction, design, tool engineering, production technology, surface engineering and recycling. The aim is, to equip the students with knowledge and technical skills, and to use the material "polymer" meeting its requirements in an economical and ecological way.

The students

- are able to describe and classify polymers based on the fundamental synthesis processing techniques
- can find practical applications for state-of-the-art polymers and manufacturing technologies
- are able to apply the processing techniques, the application of polymers and polymer composites regarding to the basic principles of material science
- can describe the special mechanical, chemical and electrical properties of polymers and correlate these properties to the chemical bindings.
- can define application areas and the limitation in the use of polymers

**requirements:**

none

**workload:**


regular attendance: 21 hours





self-study: 99 hours

**Literature**

Literaturhinweise, Unterlagen und Teilmanuskript werden in der Vorlesung ausgegeben.

**T****3.281 Course: Polymer Engineering II [T-MACH-102138]****Responsible:** Dr.-Ing. Wilfried Liebig**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
2

Events					
ST 2025	2174596	<a href="#">Polymer Engineering II</a>	2 SWS	Lecture / 	Liebig
Exams					
WT 24/25	76-T-MACH-102138	<a href="#">Polymerengineering II</a>			Liebig
ST 2025	76-T-MACH-102138	<a href="#">Polymerengineering II</a>			Liebig

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral exam, about 25 minutes

**Prerequisites**

T-MACH-114007 must not be started.

**Recommendation**

Knowledge in Polymerengineering I

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Polymer Engineering II**2174596, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site**



**Content**

1. Processing of polymers
  2. Properties of polymer components
- Based on practical examples and components
- 2.1 Selection of material
  - 2.2 Component design
  - 2.3 Tool engineering
  - 2.4 Production technology
  - 2.5 Surface engineering
  - 2.6 Sustainability, recycling

**learning objectives:**

The field of Polymer Engineering includes synthesis, material science, processing, construction, design, tool engineering, production technology, surface engineering and recycling. The aim is, that the students gather knowledge and technical skills to use the material "polymer" meeting its requirements in an economical and ecological way.

The students

- can describe and classify different processing techniques and can exemplify mould design principles based on technical parts.
- know about practical applications and processing of polymer parts
- are able to design polymer parts according to given restrictions
- can choose appropriate polymers based on the technical requirements
- can decide how to use polymers regarding the production, economical and ecological requirements

**requirements:**

Polymerengineering I

**workload:**


The workload for the lecture Polymerengineering II 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**

Literaturhinweise, Unterlagen und Teilmanuskript werden in der Vorlesung ausgegeben.

Recommended literature and selected official lecture notes are provided in the lecture.

**T****3.282 Course: Polymers in MEMS A: Chemistry, Synthesis and Applications [T-MACH-102192]****Responsible:** Dr.-Ing. Bastian Rapp**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2141853	<a href="#">Polymers in MEMS A: Chemistry, Synthesis and Applications</a>	2 SWS	/ 	Worgull
Exams					
WT 24/25	76-T-MACH-102192	<a href="#">Polymers in MEMS A: Chemistry, Synthesis and Applications</a>	Rapp, Worgull		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral examination

**Prerequisites**

none


**Workload**





120 hours

*Below you will find excerpts from events related to this course:***V****Polymers in MEMS A: Chemistry, Synthesis and Applications**2141853, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Blended (On-Site/Online)****Organizational issues**

Findet als Blockveranstaltung am Semesterende statt.

**T****3.283 Course: Polymers in MEMS B: Physics, Microstructuring and Applications [T-MACH-102191]****Responsible:** Dr.-Ing. Matthias Worgull**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2141854	<a href="#">Polymers in MEMS B: Physics, Microstructuring and Applications</a>	2 SWS	Lecture / 	Worgull
Exams					
WT 24/25	76-T-MACH-102191	<a href="#">Polymers in MEMS B: Physics, Microstructuring and Applications</a>	Worgull		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral examination

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Polymers in MEMS B: Physics, Microstructuring and Applications**2141854, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**Blended (On-Site/Online)**


**T****3.284 Course: Polymers in MEMS C: Biopolymers and Bioplastics [T-MACH-102200]**





**Responsible:** Dr.-Ing. Bastian Rapp  
Dr.-Ing. Matthias Worgull

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2142855	<a href="#">Polymers in MEMS C - Biopolymers and Bioplastics</a>	2 SWS	/ 	Worgull
Exams					
WT 24/25	76-T-MACH-102200	<a href="#">Polymers in MEMS C: Biopolymers and Bioplastics</a>			Worgull, Rapp

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Oral examination

**Prerequisites**

none

**Workload**

120 hours

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

**V****Polymers in MEMS C - Biopolymers and Bioplastics**

2142855, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Blended (On-Site/Online)**

**Content**

Polymers are ubiquitous in everyday life: from packaging materials all the way to specialty products in medicine and medical engineering. Today it is difficult to find a product which does not (at least in parts) consist of polymeric materials. The question of how these materials can be improved with respect to their disposal and consumption of (natural) resources during manufacturing is often raised. Today polymers must be fully recycled in Germany and many other countries due to the fact that they do not (or only very slowly) decompose in nature. Furthermore significant reductions of crude oil consumption during synthesis are of increasing importance in order to improve the sustainability of this class of materials. With respect to disposal polymers which do not have to be disposed by combustion but rather allow natural decomposition (composting) are of increasing interest. Polymers from renewable sources are also of interest for modern microelectromechanical systems (MEMS) especially if the systems designed are intended as single-use products.

This lecture will introduce the most important classes of these so-called biopolymers and bioplastics. It will also discuss and highlight polymers which are created from naturally created analogues (e.g. via fermentation) to petrochemical polymer precursors and describe their technical processing. Numerous examples from MEMS as well as everyday life will be given.

Some of the topics covered are:

- What are biopolyurethanes and how can you produce them from castor oil?
- What are "natural glues" and how are they different from chemical glues?
- How do you make tires from natural rubbers?
- What are the two most important polymers for life on earth?
- How can you make polymers from potatoes?
- Can wood be formed by injection molding?
- How do you make buttons from milk?
- Can you play music on biopolymers?
- Where and how do you use polymers for tissue engineering?
- How can you built LEGO with DNA?

The lecture will be given in German language unless non-German speaking students attend. In this case, the lecture will be given in English (with some German translations of technical vocabulary). The lecture slides are in English language and will be handed out for taking notes. Additional literature is not required.

For further details, please contact the lecturer, PD Dr.-Ing. Matthias Worgull ([matthias.worgull@kit.edu](mailto:matthias.worgull@kit.edu)). Preregistration is not necessary.

**Organizational issues**

Für weitere Rückfragen, wenden Sie sich bitte an PD Dr.-Ing- Matthias Worgull ([matthias.worgull@kit.edu](mailto:matthias.worgull@kit.edu)). Eine Voranmeldung ist nicht notwendig.

**Literature**

Zusätzliche vorlesungsbegleitende Literatur ist nicht notwendig.

**T****3.285 Course: Powertrain Systems Technology B: Stationary Machinery [T-MACH-105216]**

**Responsible:** Prof. Dr.-Ing. Tobias Düser  
Sascha Ott

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Written examination



**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
3

Events					
WT 24/25	2145150	<a href="#">Powertrain Systems Technology B: Stationary Machinery</a>	2 SWS	Lecture / 	Düser, Ott
Exams					
WT 24/25	76-T-MACH-105216	<a href="#">Powertrain Systems Technology B: Stationary Machinery</a>	Albers, Ott		
ST 2025	76-T-MACH-105216	<a href="#">Drive Systems Engineering B: Stationary Machinery</a>	Albers, Ott		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written examination: 60 min duration

**Prerequisites**

None

**Workload**

120 hours

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

**V****Powertrain Systems Technology B: Stationary Machinery**

2145150, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

Students acquire the basic skills needed to develop future energy-efficient and safe drive system solutions for use in industrial environments. The course considers holistic development methods and evaluations of drive systems. The focal points can be divided into the following chapters:

- Powertrain System
- Operator System
- Environment System
- System Components
- Development Process

**Recommendations:**

- Powertrain Systems Technology A: Automotive Systems

**Literature**



VDI-2241: "Schaltbare 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

**3.286 Course: Practical Course Combustion Technology [T-CIWVT-108873]****Responsible:** Dr.-Ing. Stefan Raphael Harth**Organisation:** KIT Department of Chemical and Process Engineering**Part of:** [M-MACH-105100 - Courses of the KIT Department of Chemical and Process Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2232060	<a href="#">Practical Course Combustion Technology</a>	3 SWS	Practical course / 	Trimis, Harth
ST 2025	2232321	<a href="#">Laboratory Work in Combustion Technology</a>	3 SWS	Practical course / 	Harth
Exams					
WT 24/25	7231401	<a href="#">Practical Course Combustion Technology</a>			Harth
ST 2025	7231401	<a href="#">Practical Course Combustion Technology</a>			Harth

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

The examination is an oral examination with a duration of 20 minutes (section 4 subsection 2 number 2 SPO).

**Prerequisites**

None



### 3.287 Course: Practical Course Technical Ceramics [T-MACH-105178]

**Responsible:** apl. Prof. Dr. Günter Schell

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each winter term	2

Events					
WT 24/25	2125751	<a href="#">Practical Course Technical Ceramics</a>	2 SWS	Practical course /	Schell
Exams					
WT 24/25	76-T-MACH-105178	<a href="#">Practical Course Technical Ceramics</a>	Schell		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

Colloquium and laboratory report for the respective experiments.

#### Prerequisites

none

#### Workload

30 hours

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



#### Practical Course Technical Ceramics

2125751, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Practical course (P)  
On-Site**

#### Organizational issues

Elektronisch über das ILIAS-Portal

#### Literature

Salmang, H.: Keramik, 7. Aufl., Springer Berlin Heidelberg, 2007. - Online-Ressource

Richerson, D. R.: Modern Ceramic Engineering, CRC Taylor & Francis, 2006



**T****3.288 Course: Practical Training in Basics of Microsystem Technology [T-MACH-102164]****Responsible:** Dr. Arndt Last**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	4	Grade to a third	Each term	1

Events					
WT 24/25	2143875	<a href="#">Introduction to Microsystem Technology - Practical Course</a>	2 SWS	Practical course /	Last
WT 24/25	2143877	<a href="#">Introduction to Microsystem Technology - Practical Course</a>	2 SWS	Practical course /	Last
ST 2025	2143875	<a href="#">Introduction to Microsystem Technology - Practical Course</a>	2 SWS	Practical course /	Last
Exams					
WT 24/25	76-T-MACH-102164	<a href="#">Practical Training in Basics of Microsystem Technology</a>	Last		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

The assessment consists of a written exam

**Prerequisites**

none

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

**V****Introduction to Microsystem Technology - Practical Course**2143875, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Practical course (P)**  
**On-Site****Literature**Menz, W., Mohr, J.: Mikrosystemtechnik für Ingenieure, VCH-Verlag, Weinheim, 1997  
Unterlagen zum Praktikum zur Vorlesung 'Grundlagen der Mikrosystemtechnik'**V****Introduction to Microsystem Technology - Practical Course**2143877, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Practical course (P)**  
**On-Site****Literature**Menz, W., Mohr, J.: Mikrosystemtechnik für Ingenieure, VCH-Verlag, Weinheim, 1997  
Unterlagen zum Praktikum zur Vorlesung 'Grundlagen der Mikrosystemtechnik'**V****Introduction to Microsystem Technology - Practical Course**2143875, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Practical course (P)**  
**On-Site**

**Content**

In the practical training includes ten experiments:

1. Röntgenoptik
2. UVL + REM
3. Mischerbauteil
4. Rasterkraftmikroskopie
5. 3D-Printing
6. Lichtstreuung an Chrommasken
7. Abformung
8. SAW-Biosensorik
9. Nano3D-Drucker - Materialtransfer dünnster Schichten
10. Elektrospinning

Each student takes part in only four experiments.

The experiments are carried out at real workstations at the IMT and coached by IMT-staff.

**Organizational issues**

Das Praktikum findet in den Laboren des IMT am CN statt. Treffpunkt: Bau 301, vor dem Eingang.

Teilnahmeanfragen an [arndt.last@kit.edu](mailto:arndt.last@kit.edu)

**Literature**

Menz, W., Mohr, J.: Mikrosystemtechnik für Ingenieure, VCH-Verlag, Weinheim, 1997

Unterlagen zum Praktikum zur Vorlesung 'Grundlagen der Mikrosystemtechnik'

## T

**3.289 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each summer term	1

**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





**Workload**

120 hours

## T

**3.290 Course: Principles of Ceramic and Powder Metallurgy Processing [T-MACH-102111]****Responsible:** apl. Prof. Dr. Günter Schell**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2193010	<a href="#">Basic principles of powder metallurgical and ceramic processing</a>	2 SWS	Lecture / 	Schell
Exams					
WT 24/25	76-T-MACH-102111	<a href="#">Principles of Ceramic and Powder Metallurgy Processing</a>	Schell, Wagner		
ST 2025	76-T-MACH-102111	<a href="#">Principles of Ceramic and Powder Metallurgy Processing</a>	Schell		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**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

**Workload**

120 hours


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





## V

**Basic principles of powder metallurgical and ceramic processing**2193010, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**Blended (On-Site/Online)****Literature**

- R.J. Brook: Processing of Ceramics I+II, VCH Weinheim, 1996
- M.N. Rahaman: Ceramic 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. Thümmel, R. Oberacker. "Introduction to Powder Metallurgy", Institute of Materials, 1993

**T****3.291 Course: Principles of Medicine for Engineers [T-MACH-105235]****Responsible:** apl. Prof. Dr. Christian Pylatiuk**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Written examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2105992	<a href="#">Principles of Medicine for Engineers</a>	2 SWS	Lecture / 	Pylatiuk
Exams					
WT 24/25	76-T-MACH-105235	<a href="#">Principles of Medicine for Engineers</a>	Pylatiuk		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Written examination (Duration: 45min)

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Principles of Medicine for Engineers**2105992, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content****Content:**

- Introduction: Definitions of "health" and "disease". History of medicine and paradigm shift towards evidence based medicine and personalized medicine.
- Special topics: nervous system, saltatory conduction, musculoskeletal system, cardio-circulatory system, narcosis, pain, respiratory system, sensory organs, gynaecology, digestive organs, surgery, nephrology, orthopaedics, immune system, genetics.

**Learning objectives:**

Students have fundamental knowledge about functionality and anatomy of organs within different medical disciplines. The students further know about technical methods in diagnosis and therapy, common diseases, their relevance and costs. Finally the students are able to communicate with medical doctors in a way, in which they prevent misunderstandings and achieve a more realistic idea of each others expectations.

**Literature**

- Adolf Faller, Michael Schünke: Der Körper des Menschen. Thieme Verlag.
- Renate Huch, Klaus D. Jürgens: Mensch Körper Krankheit. Elsevier Verlag.

**T****3.292 Course: Principles of Whole Vehicle Engineering [T-MACH-114095]****Responsible:** Dr. Manfred Harrer**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each term	1

**Competence Certificate**

Written examination

Duration: 90 minutes

Auxiliary means: none

**Prerequisites**

T-MACH-114075 – Grundsätze der PKW-Entwicklung must not be started.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-114075 - Principles of Whole Vehicle Engineering](#) must not have been started.

**Workload**

120 hours

**T****3.293 Course: Principles of Whole Vehicle Engineering [T-MACH-114075]****Responsible:** Dr. Manfred Harrer**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each term	1

**Competence Certificate**

Written examination

Duration: 90 minutes

Auxiliary means: none

**Prerequisites**

T-MACH-114095 - Fundamentals of Automobile Development must not be started.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-114095 - Principles of Whole Vehicle Engineering](#) must not have been started.

**Workload**

120 hours



### 3.294 Course: Probabilistic Measurement and Estimation [T-MACH-113873]

**Responsible:** Prof. Dr.-Ing. Christoph Stiller

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	4	Grade to a third	Each summer term	1 terms	2

Events					
ST 2025	2138334	<a href="#">Probabilistic Measurement and Estimation</a>	3 SWS	Lecture /	Stiller, Steiner

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

written exam

60 min.

2 DIN A4 Self-created formular sheets allowed

#### Prerequisites

none

#### Workload

120 hours

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



#### Probabilistic Measurement and Estimation

2138334, SS 2025, 3 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

##### Lerninhalt (EN)

1. Amplifiers
2. Digital technology
3. Stochastic modeling for measurement applications
4. Estimation
5. Kalman Filter
6. Environmental perception

##### Lernziele (EN):

The capabilities of modern sensor technology pave the way for novel applications in engineering. Especially digital measurement techniques may be used even in very complex environments and thus have strong impact on technological progress. Stochastic models of measurement processes form the basis for meaningful information processing and provide a valuable tool for engineering. This interdisciplinary lecture addresses students in mechanical engineering and related subjects. The lecture gives an overview of digital technology and stochastics. These areas form the basics of estimation methods that can be embedded elegantly in the theory of state observers. Applications in signal processing for modern environmental perception (video, Lidar, Radar) illustrate the discussed subjects.

##### Nachweis:

Written exam

60 minutes

Individual sheet of formulas

##### Arbeitsaufwand:

In total 120h:

Attendance time: 20 h

Self-study: 100 h



**Literature**

Skript und Foliensatz zur Veranstaltung werden als kostenlose pdf-Dateien bereitgestellt. Weitere Empfehlungen werden in der Vorlesung bekannt gegeben.

Idealerweise haben Sie zuvor 'Grundlagen der Mess- und Regelungstechnik' gehört oder verfügen aus einer Vorlesung anderer Fakultäten über grundlegende Kenntnisse der Mess- und Regelungstechnik und der Systemtheorie.

**T****3.295 Course: Probability Theory and Statistics [T-MATH-109620]**

**Responsible:** Prof. Dr. Nicole Bäuerle  
 Dr. rer. nat. Bruno Ebner  
 Prof. Dr. Vicky Fasen-Hartmann  
 Prof. Dr. Daniel Hug  
 PD Dr. Bernhard Klar  
 Prof. Dr. Günter Last  
 Prof. Dr. Mathias Trabs  
 PD Dr. Steffen Winter

**Organisation:** KIT Department of Mathematics

**Part of:** [M-MACH-104885 - Courses of the KIT Department of Mathematics](#)

**Type**  
Written examination

**Credits**  
5

**Grading scale**  
Grade to a third

**Version**  
7

Exams			
WT 24/25	00013	<a href="#">Fundamentals of Probability and Statistics for Students of Computer Science</a>	Göll, Trabs

**Competence Certificate**

Written exam (90 min.)



### 3.296 Course: Process Simulation in Forming Operations [T-MACH-105348]

**Responsible:** Dr.-Ing. Dirk Helm

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

Events					
WT 24/25	2161501	<a href="#">Process Simulation in Forming Operations</a>	2 SWS	Lecture /	Helm

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

oral exam, 20 min.

#### Prerequisites

none

#### Workload

120 hours

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



#### Process Simulation in Forming Operations

2161501, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**

#### Content

Based on basics of continuum mechanics, material theory and numerics the lecture gives an introduction into the simulation of forming operations for metals

- plasticity for metallic materials: dislocations, twinning, phase transformations, anisotropy, hardening
- classification of forming operations and discussion of selected topics
- basics of tensor algebra and tensor analysis
- continuum mechanics: kinematics, finite deformations, balance laws, thermodynamics
- material theory: basics, modelling concepts, plasticity and visco plasticity, yield functions (von Mises, Hill, ...), kinematic and isotropic hardening, damage
- thermomechanical coupling
- modelling of contact
- finite element method: explicit and implicit formulations, types of elements, numerical integration of material models
- process simulation of selected problems of sheet metal forming

**3.297 Course: Product and Innovation Management [T-WIWI-109864]****Responsible:** Prof. Dr. Martin Klarmann**Organisation:** KIT Department of Economics and Management**Part of:** [M-MACH-104884 - Courses of the KIT Department of Economics and Management](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	3	Grade to a third	Each summer term	3

**Competence Certificate**

The assessment of success takes place through a written exam with additional aids in the sense of an open book exam. Further details will be announced during the lecture.

**Prerequisites**

None

**Annotation**

For further information, please contact Marketing & Sales Research Group ([marketing.iism.kit.edu](mailto:marketing.iism.kit.edu)).

**T****3.298 Course: Product- and Production-Concepts for Modern Automobiles [T-MACH-110318]**

**Responsible:** Dr. Stefan Kienzle  
Dr. Dieter Steegmüller

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)


**Type**  
Oral examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2149670	<a href="#">Product- and Production-Concepts for modern Automobiles</a>	2 SWS	Lecture / 	Steegmüller, Kienzle
Exams					
WT 24/25	76-T-MACH-110318	<a href="#">Product- and Production-Concepts for modern Automobiles</a>	Steegmüller, Kienzle		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Oral Exam (20 min)

**Prerequisites**

T-MACH-105166 - Materials and Processes for Body Lightweight Construction in the Automotive Industry must not have been started.

**Workload**

120 hours

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

**V****Product- and Production-Concepts for modern Automobiles**

2149670, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**

**Content**

The lecture illuminates the practical challenges of modern automotive engineering. As former leaders of the automotive industry, the lecturers refer to current aspects of automotive product development and production.

The aim is to provide students with an overview of technological trends in the automotive industry. In this context, the course also focuses on changes in requirements due to new vehicle concepts, which may be caused by increased demands for individualisation, digitisation and sustainability. The challenges that arise in this context will be examined from both a production technology and product development perspective and will be illustrated with practical examples thanks to the many years of industrial experience of both lecturers.

The topics covered are:

- General conditions for vehicle and body development
- Integration of new drive technologies
- Functional requirements (crash safety etc.), also for electric vehicles
- Development Process at the Interface Product & Production, CAE/Simulation
- Energy storage and supply infrastructure
- Aluminium and lightweight steel construction
- FRP and hybrid parts
- Battery, fuel cell and electric motor production
- Joining technology in modern car bodies
- Modern factories and production processes, Industry 4.0.

**Learning Outcomes:**

The students ...

- are able to name the presented general conditions of vehicle development and are able to discuss their influences on the final product using practical examples.
- are able to name the various lightweight approaches and identify possible areas of application.
- are able to identify the different production processes for manufacturing lightweight structures and explain their functions.
- are able to perform a process selection based on the methods and their characteristics.

**Workload:**

regular attendance: 25 hours

self-study: 95 hours

**Organizational issues**

Termine werden über Ilias bekannt gegeben.

Bei der Vorlesung handelt es sich um eine Blockveranstaltung. Eine Anmeldung über Ilias ist erforderlich.

Zur Vertiefung des im Rahmen der Lehrveranstaltung erworbenen Wissens werden die theoretischen Vorlesungseinheiten durch Praxiseinheiten im Umfeld der Karlsruher Forschungsfabrik (<https://www.karlsruher-forschungsfabrik.de>) unterstützt.

The lecture is a block course. An application in Ilias is mandatory.

The theoretical lectures are complemented by practical lectures in the Karlsruhe Research Factory (<https://www.karlsruher-forschungsfabrik.de/en.html>) to deepen the acquired knowledge.

**Literature****Medien:**

Skript zur Veranstaltung wird über (<https://ilias.studium.kit.edu/>) bereitgestellt.

**Media:**

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

**T****3.299 Course: Product Development - Dimensioning of Components [T-MACH-105383]**

**Responsible:** Dr.-Ing. Stefan Dietrich  
Prof. Dr.-Ing. Volker Schulze

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	7	Grade to a third	Each summer term	1

Events					
ST 2025	2150511	<a href="#">Product Development - Component Dimensioning</a>		Lecture / Practice ( / )	Schulze, Dietrich
Exams					
WT 24/25	76-T-MACH-105383	<a href="#">Product Development - Dimensioning of Components</a>			Schulze
ST 2025	76-T-MACH-105383	<a href="#">Product Development - Dimensioning of Components</a>			Schulze

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

written exam (2 hours)

**Prerequisites**

none

**Workload**

210 hours

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

**V****Product Development - Component Dimensioning**

2150511, SS 2025, SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)  
On-Site**

**Content**

The aim of the lecture is to present the topics of the dimensioning and the material science in their connection and to learn how to deal with corresponding methods and the combination thereof.

For the prospective engineer the most important educational objective is to understand the interaction of these topics while the interplay of the individual material stresses in the component are clarified.

The topics in detail are

Structural dimensioning: basic stresses, superimposed stresses, notch influence, fatigue limit, fatigue strength, assessment of cracked components, operational strength, residual stresses, high temperature stress and corrosion

Material selection: Basics, material indices, material selection diagrams, Ashby procedure, multiple boundary conditions, target conflicts, shape and efficiency.

Learning target: The students...

are capable to design and dimension components according to their load.

can include mechanical material properties from the mechanical material test in the dimensioning process.

can identify superimposed total loads and critical loads on simple components and to compute them.

acquire the skill to select materials based on the application area of the components and respective loads.

Examination: written exam (2 hours)

**Organizational issues**

Freitags generell nach Vereinbarung

**Literature**

Vorlesungsskript



### 3.300 Course: Product Lifecycle Management [T-MACH-105147]

**Responsible:** Prof. Dr.-Ing. Jivka Ovtcharova

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Written examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	2121350	<a href="#">Product Lifecycle Management</a>	2 SWS	Lecture /	Ovtcharova, Meyer, Rönnau
Exams					
WT 24/25	76-T-MACH-105147	<a href="#">Product Lifecycle Management</a>			Ovtcharova, Meyer, Rönnau
WT 24/25	76-T-MACH-105147-mdl	<a href="#">Product Lifecycle Management</a>			Elstermann

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

Written examination 90 min.

#### Prerequisites

None

#### Workload

120 hours

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



### Product Lifecycle Management

2121350, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

The course includes:

- Basics for product data management and data exchange
- IT system solutions for Product Lifecycle Management (PLM)
- Economic viability analysis and implementation problems
- Illustrative scenario for PLM using the example of the institute's own I4.0Lab

After successful attendance of the course, students can:

- identify the challenges of data management and exchange and describe solution concepts for these challenges.
- clarify the management concept PLM and its goals and highlight the economic benefits.
- explain the processes required to support the product life cycle and describe the most important business software systems (PDM, ERP, ...) and their functions.



**Literature**

Vorlesungsfolien.

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****3.301 Course: Product, Process and Resource Integration in the Automotive Industry [T-MACH-102155]****Responsible:** Prof. Dr.-Ing. Sama Mbang**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	2

**Competence Certificate**

Oral examination 20 min.

**Prerequisites**

None


**Annotation**





Limited number of participants.

**Workload**

120 hours

**3.302 Course: Production Operations Management [T-MACH-110327]****Responsible:** Prof. Dr.-Ing. Kai Furmans**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Written examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	3118031	<a href="#">Production Operations Management</a>	3 SWS	Lecture / Practice ( /  )	Furmans, Lanza
Exams					
WT 24/25	76-T-MACH-110327	<a href="#">Production Operations Management (MEI)</a>	Lanza, Furmans		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam (duration: 90 min)

**Prerequisites**

T-MACH-110326 - Production Operations Management-Project must have been completed successfully.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-110326 - Production Operations Management-Project](#) must have been passed.

**Workload**

90 hours

*Below you will find excerpts from events related to this course:***Production Operations Management**3118031, WS 24/25, 3 SWS, Language: English, [Open in study portal](#)**Lecture / Practice (VÜ)**  
**On-Site****Content**

T-MACH-110326 - Production Operations Management-Project must have been completed successfully when registering for this course.

The lecture covers the basics of operations and supply chain management as well as business management basics in accounting, investment calculation and legal forms and sustainability and concepts of circular economy.

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

Attendance time: 25 hours,


Self-study: 65 hours





**Organizational issues**

Räume werden vom Institut im Ilias-Kurs bekannt gegeben.

**3.303 Course: Production Operations Management-Project [T-MACH-110326]****Responsible:** Prof. Dr.-Ing. Kai Furmans**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	2	Grade to a third	Each winter term	1

Events					
WT 24/25	3118032	<a href="#">Production Operations Management-Project</a>	1 SWS	Project (P /  )	Furmans, Lanza
Exams					
WT 24/25	76-T-MACH-110326	<a href="#">Production Operations Management-Project</a>			Lanza, Furmans

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

For solving four case studies as a group work, a maximum of 100 points per case study and student will be awarded. The defense of the case studies will be assessed as an individual contribution with a maximum of 100 points. The maximum score of 500 points corresponds to a grade of 1.0. A detailed evaluation scheme will be provided to the students during the course.

**Prerequisites**

none

**Workload**

60 hours

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

**Production Operations Management-Project**3118032, WS 24/25, 1 SWS, Language: English, [Open in study portal](#)**Project (PRO)  
Blended (On-Site/Online)****Content**

Students are divided into groups for this course. Four case studies will be carried out in these groups. The results of the group work will be presented and evaluated in writing. Prerequisite for the participation in the case study is the previous successful participation in a multiple choice test, which can be repeated online several times in a given period. The result of the group work is presented and evaluated in writing. In addition, selected groups will present and defend their results.

After successful completion of the lecture you will be able to work alone and in a team

- to **name** the treated **technical terms** in the areas of production, logistics and business administration,
- to accurately **describe** the connections between these areas in a discussion with experts,
- to describe **qualitatively** and **quantitatively** the most important decision-making problems in this field,
- to use the corresponding qualitative and quantitative decision models,
- to critically **evaluate** their results and draw conclusions from them,
- as well as to expand the methods and models discussed through **own research**.

The participation of all members of the selected groups in the oral defenses is compulsory and will be controlled. Four written submissions must be passed. For the written submission the group receives a common grade, in the defense each group member is evaluated individually. The defenses are fully included in the grade, but they do not have to be passed in order to pass the entire event. The final score of the event consists of 80% of the written submissions and 20% of the defense evaluation.

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.

Attendance time: 17 hours,

Self-study: 43 hours

**Organizational issues**

Räume werden vom Institut bekannt gegeben.

**3.304 Course: Production Techniques Laboratory [T-MACH-105346]**

**Responsible:** Prof. Dr.-Ing. Barbara Deml  
 Prof. Dr.-Ing. Jürgen Fleischer  
 Prof. Dr.-Ing. Kai Furmans  
 Prof. Dr.-Ing. Jivka Ovtcharova

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	4	pass/fail	Each summer term	4

Events					
ST 2025	2110678	<a href="#">Production Techniques Laboratory</a>	4 SWS	Practical course /	Deml, Fleischer, Furmans, Meyer

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Active participation in lab course and successful completion of colloquia before each course. The colloquia are graded.

**Annotation**

The course is limited in capacity, therefore the allocation of places is based on § 5 (4) in the Study and Examination Regulations

This results in the following selection criteria:

The selection is based

- on the study progress (here the study progress in credit points and not the study progress in semesters is taken as a basis),
- on the waiting period in the case of equal progress in studies
- by lot if the waiting period is the same.

The procedure is explained in more detail on ILIAS.

Successful participation requires active and continuous participation in the course.

**Workload**

120 hours

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

**Production Techniques Laboratory**

2110678, SS 2025, 4 SWS, Language: German, [Open in study portal](#)

**Practical course (P)**  
**Blended (On-Site/Online)**

### Content

The production technique laboratory (PTL) is a collaboration of the institutes wbk, IFL, IMI and ifab.

1. Information management for I4.0 (IMI)
2. VR-supported product development (IMI)
3. Production of parts with CNC turning machines (wbk)
4. Controlling of production systems using PLCs (wbk)
5. Automated assembly systems (wbk)
6. Flexible material flow in the age of Industry 4.0 (IFL)
7. Identification in production and logistics (IFL)
8. Storage and order-picking systems (IFL)
9. Production Management (ifab)
10. Time study (ifab)
11. Accomplishment of workplace design (ifab)

### Recommendations:

Participation in the following lectures:

- Informationssystems in logistics and supply chain management
- Material flow in logistic systems
- Manufacturing technology
- Human Factors Engineering

### Learning Objects:

The students acquire in the lab 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.

After completion this lab, the students are able

- to analyse and solve planning and layout problems of the discussed fields,
- to evaluate and configure the quality and efficiency of production, processes and products,
- to plan, control and evaluate the production of a production enterprise,
- to configure and evaluate the IT architecture of a production enterprise,
- to design and evaluate appropriate techniques for conveying, handling and picking within a production system,
- to design and evaluate the part production and the assembly by considering the work processes and the work places.

### Organizational issues

Anwesenheitspflicht, Teilnehmerzahl begrenzt. Anmeldung über ILIAS

Arbeitsaufwand von 120 h (=4 LP).

Nachweis: **bestanden / nicht bestanden**

Regelmäßige Teilnahme an Praktikumsversuchen und erfolgreiche Eingangskolloquien.

Zur Vertiefung des im Rahmen der Lehrveranstaltung erworbenen Wissens werden die theoretischen Vorlesungseinheiten durch Praxiseinheiten unterstützt.

### Literature

Das Skript und Literaturhinweise stehen auf ILIAS zum Download zur Verfügung.

**T****3.305 Course: Productivity Management in Production Systems [T-MACH-105523]****Responsible:** Prof. Dr.-Ing. Sascha Stowasser**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2110046	<a href="#">Productivity Management in Production Systems</a>	3 SWS	/ ●	Stowasser

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam (approx. 30 min)

The exam is offered in German only!

**Prerequisites**

none

**Annotation**The course is capacity-limited, therefore the **allocation of places** is based on § 5 para. 4 in the module handbook:**Registration and admission to module examinations and courses** . This results in the following selection criteria:

- Students of the degree program have priority over students from outside the degree program
- Among students within the degree program, a decision may be made based on academic progress (not just with subject semesters)
- In the case of equal academic progress according to waiting time
- In the case of equal waiting time by lot

The exact procedure is explained on **ILIAS**."Successful participation requires active and continuous participation in the course."**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Productivity Management in Production Systems**2110046, SS 2025, 3 SWS, Language: German, [Open in study portal](#)**On-Site**

**Content**

1. Definition and terminology of process design and industrial engineering
2. Tasks of industrial engineering
3. Actual approaches of organisation of production (Holistic production systems, Guided group work et al.)
4. Methods and principles of industrial engineering and production systems
5. Case studies and exercises for process design
6. Industry 4.0

**Requirements:**

- Compact course (one week full-time)
- Limited number of participants; seats are assigned according the date of registration
- Registration via ILIAS is required
- Compulsory attendance during the whole lecture

**Recommendations:**

- Knowledge of work science is helpful

**Learning objective:**

- Ability to design work operations and processes effectively and efficiently
- Instruction in methods of time study (MTM, Data acquisition etc.)
- Instruction in methods and principles of process design
- The Students are able to apply methods for the design of workplaces, work operations and processes.
- The Students are able to apply actual approaches of process and production organisation.


**Literature**





Das Skript und Literaturhinweise stehen auf ILIAS zum Download zur Verfügung.



**T****3.306 Course: Project Report Water Distribution Systems [T-BGU-108485]****Responsible:** Dr.-Ing. Peter Oberle**Organisation:** KIT Department of Civil Engineering, Geo and Environmental Sciences**Part of:** [M-MACH-105405 - Courses of the KIT Department of Civil Engineering, Geo and Environmental Sciences](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each winter term	2

Events					
WT 24/25	6222905	<a href="#">Water Distribution Systems</a>	4 SWS	Lecture / Practice ( /  )	Oberle
Exams					
WT 24/25	8244108485	<a href="#">Project Report Water Distribution Systems</a>	Oberle		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**project report, appr. 15 pages, and  
presentation, appr. 15 min.**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**Workload**

60 hours

T

**3.307 Course: Project work [T-MACH-110106]**

**Responsible:** Prof. Dr.-Ing. Bettina Frohnapfel  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** [M-MACH-104840 - Project](#)

Type	Credits	Grading scale	Recurrence	Version
Final Thesis	20	Grade to a third	Each term	1

**Competence Certificate**

The Project work consists of a written report of a scientific subject chosen by the student himself/herself or given by the supervisor. The Project work 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.

**Prerequisites**

none

**Final Thesis**

This course represents a final thesis. The following periods have been supplied:

<b>Submission deadline</b>	6 months
<b>Maximum extension period</b>	1 months
<b>Correction period</b>	6 weeks

**Workload**

600 hours

**3.308 Course: Project Workshop: Automotive Engineering [T-MACH-102156]**

**Responsible:** Dr.-Ing. Michael Frey  
Dr.-Ing. Martin Gießler

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each term	1

Events					
WT 24/25	2115817	<a href="#">Project Workshop: Automotive Engineering</a>	3 SWS	Lecture /	Gießler, Frey
ST 2025	2115817	<a href="#">Project Workshop: Automotive Engineering</a>	3 SWS	Lecture /	Gießler, Frey

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Oral examination

Duration: 30 up to 40 minutes

Auxiliary means: none

**Prerequisites**

none

**Workload**

180 hours

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

**Project Workshop: Automotive Engineering**

2115817, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**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.

Learning Objectives:

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.

**Organizational issues**

Begrenzte Teilnehmerzahl mit Auswahlverfahren, in deutscher Sprache. Bewerbungen sind am Ende des vorhergehenden Semesters einzureichen.

Termin und Raum: siehe Institutshomepage.

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.

**Literature**

Steinle, Claus; Bruch, Heike; Lawa, Dieter (Hrsg.), Projektmanagement, Instrument moderner Innovation, FAZ Verlag, Frankfurt a. M., 2001, ISBN 978-3929368277

Skripte werden beim Start-up Meeting ausgegeben.

The scripts will be supplied in the start-up meeting.

**Project Workshop: Automotive Engineering**

2115817, SS 2025, 3 SWS, Language: German, [Open in study portal](#)

**Lecture (V)  
On-Site**

**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.

Learning Objectives:

The students are familiar with typical industrial development processes and working style. They are able to apply knowledge gained at the university to a practical task. They are able to analyze and to judge complex relations. They are ready to work self-dependently, to apply different development methods and to work on approaches to solve a problem, to develop practice-oriented products or processes.

**Organizational issues**

Begrenzte Teilnehmerzahl mit Auswahlverfahren, die Bewerbungen sind am Ende des vorhergehenden Semesters einzureichen.

Raum und Termine: s. Aushang bzw. Homepage

**Literature**

Steinle, Claus; Bruch, Heike; Lawa, Dieter (Hrsg.), Projektmanagement, Instrument moderner Innovation, FAZ Verlag, Frankfurt a. M., 2001, ISBN 978-3929368277

Skripte werden beim Start-up Meeting ausgegeben.



### 3.309 Course: Python Algorithms for Vehicle Technology [T-MACH-110796]

**Responsible:** Stephan Rhode

**Organisation:**

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2114862	<a href="#">Python Algorithms for Automotive Engineering</a>	2 SWS	Lecture /	Rhode
Exams					
ST 2025	76-T-MACH-110796	<a href="#">Python Algorithm for Vehicle Technology</a>			Rhode

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

Written Examination

Duration: 90 minutes

#### Prerequisites

none

#### Workload

120 hours

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



### Python Algorithms for Automotive Engineering

2114862, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**

#### Content

Teaching content:

- Introduction to Python and useful tools and libraries for creating algorithms, graphical representation, optimization, symbolic arithmetic and machine learning
  - [Anaconda](#), [Pycharm](#), [Jupyter](#)
  - [NumPy](#), [Matplotlib](#), [SymPy](#), [Scikit-Learn](#)
- Methods and tools for creating software
  - Version management [GitHub](#), [git](#)
  - Testing software [pytest](#), [Pylint](#)
  - Documentation [Sphinx](#)
  - Continuous Integration (CI) [Travis CI](#)
  - Workflows in Open Source and Inner Source, Kanban, Scrum
- Practical programming projects to:
  - Road sign recognition
  - Vehicle state estimation
  - Calibration of vehicle models by mathematical optimization
  - Data-based modelling of the powertrain of an electric vehicle

#### Objectives:

The students have an overview of the programming language Python and important Python libraries to solve automotive engineering problems with computer programs. The students know current tools around Python to create algorithms, to apply them and to interpret and visualize their results. Furthermore, the students know basics in the creation of software to be used in later programming projects in order to develop high-quality software solutions in teamwork. Through practical programming projects (road sign recognition, vehicle state estimation, calibration, data-based modelling), the students can perform future complex tasks from the area of driver assistance systems.

#### Organizational issues


Die Vorlesung beginnt mit zwei Kick-Off Veranstaltung in Präsenz am 25.04. sowie am 09.05.2025 um 11:30 Uhr am Campus Ost, Geb.70.04, Raum 219. Die restlichen Termine finden überwiegend digital statt. Weitere Infos über ILIAS.





**Literature**

- A Whirlwind Tour of Python, Jake VanderPlas, Publisher: O'Reilly Media, Inc. Release Date: August 2016, ISBN: 9781492037859 [link](#)
- Scientific Computing with Python 3, Olivier Verdier, Jan Erik Solem, Claus Führer, Publisher: Packt Publishing, Release Date: December 2016, ISBN: 9781786463517 [link](#)
- Introduction to Machine Learning with Python, Sarah Guido, Andreas C. Müller, Publisher: O'Reilly Media, Inc., Release Date: October 2016, ISBN: 9781449369880, [link](#)
- Clean Code, Robert C. Martin, Publisher: Prentice Hall, Release Date: August 2008, ISBN: 9780136083238, [link](#)

## T

**3.310 Course: Quality Management [T-MACH-102107]****Responsible:** Prof. Dr.-Ing. Gisela Lanza**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Written examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
3

Events					
WT 24/25	2149667	<a href="#">Quality Management</a>	2 SWS	Lecture / 	Lanza, Stamer
Exams					
WT 24/25	76-T-MACH-102107	<a href="#">Quality Management</a>	Lanza		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Written Exam (60 min)

**Prerequisites**

It is not possible to combine this brick with brick Quality Management [T-MACH-112586].

**Workload**

120 hours

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

## V

**Quality Management**2149667, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**Blended (On-Site/Online)**

**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-specific fields 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 service related quality management. The content is completed with the presentation of certification 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 definition
- 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

**Learning Outcomes:**

The students ...

- are capable to comment on the content covered by the lecture.
- are capable of substantially quality philosophies.
- are able to apply the QM tools and methods they have learned about in the lecture to new problems from the context of the lecture.
- are able to analyze and evaluate the suitability of the methods, procedures and techniques they have learned about in the lecture for a specific problem.

**Workload:**

regular attendance: 21 hours

self-study: 99 hours

**Organizational issues**

Vorlesungstermine montags 09:45 Uhr

Übung erfolgt während der Vorlesung

**Literature****Medien:**

Skript zur Veranstaltung wird über (<https://ilias.studium.kit.edu/>) bereitgestellt:

**Media:**

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



**3.311 Course: Rail System Technology [T-MACH-106424]**

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

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each term	4

Events					
WT 24/25	2115919	<a href="#">Rail System Technology</a>	2 SWS	Lecture /	Cichon
ST 2025	2115919	<a href="#">Rail System Technology</a>	2 SWS	Lecture /	Cichon
Exams					
WT 24/25	76-T-MACH-106424	<a href="#">Rail System Technology</a>			Cichon
ST 2025	76-T-MACH-106424	<a href="#">Rail System Technology</a>			Cichon

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

written examination in German language

Duration: 60 minutes

No tools or reference materials may be used during the exam except calculator and dictionary

**Prerequisites**

none

**Workload**

120 hours

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

**Rail System Technology**

2115919, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
On-Site

**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, comparison electric traction and diesel traction, dc and ac networks, system pantograph and contact wire, filling stations

**Literature**

Eine Literaturliste steht den Studierenden auf der Ilias-Plattform zum Download zur Verfügung.

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

**Rail System Technology**

2115919, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
On-Site

**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, comparison electric traction and diesel traction, dc and ac networks, system pantograph and contact wire, filling stations

**Organizational issues**

ab SS 2024 schriftliche Prüfung

**Literature**

Eine Literaturliste steht den Studierenden auf der Ilias-Plattform zum Download zur Verfügung.

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

**3.312 Course: Rail Vehicle Technology [T-MACH-105353]****Responsible:** Prof. Dr.-Ing. Martin Cichon**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each term	4

Events					
WT 24/25	2115996	<a href="#">Rail Vehicle Technology</a>	2 SWS	Lecture /	Cichon
ST 2025	2115996	<a href="#">Rail Vehicle Technology</a>	2 SWS	Lecture /	Cichon
Exams					
WT 24/25	76-T-MACH-105353	<a href="#">Rail Vehicle Technology</a>			Cichon
ST 2025	76-T-MACH-105353	<a href="#">Rail Vehicle Technology</a>			Cichon

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

written examination in German language

Duration: approx 60 minutes

No tools or reference materials may be used during the exam except calculator and dictionary

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***Rail Vehicle Technology**2115996, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

1. Vehicle system technology: structure and main systems of rail vehicles
2. Car body: functions, requirements, design principles, crash elements, coupling, doors and windows
3. Bogies: forces, running gears, bogies, Jakobs-bogies, active components, connection to car body, wheel arrangement
4. Drives: principles, electric drives (main components, asynchronous traction motor, inverter, with DC supply, with AC supply, without line supply, multisystem vehicles, dual mode vehicles, hybrid vehicles), non-electric drives
5. Brakes: basics, principles (wheel brakes, rail brakes, blending), brake control (requirements and operation modes, pneumatic brake, electropneumatic brake, emergency brake, parking brake)
6. Train control management system: definition of TCMS, bus systems, components, network architectures, examples, future trends
7. Vehicle concepts: trams, metros, regional trains, intercity trains, high speed trains, double deck vehicles, locomotives, freight wagons

**Literature**

Eine Literaturliste steht den Studierenden auf der Ilias-Plattform zum Download zur Verfügung.

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

**Rail Vehicle Technology**2115996, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site**

**Content**

1. Vehicle system technology: structure and main systems of rail vehicles
2. Car body: functions, requirements, design principles, crash elements, coupling, doors and windows
3. Bogies: forces, running gears, bogies, Jakobs-bogies, active components, connection to car body, wheel arrangement
4. Drives: principles, electric drives (main components, asynchronous traction motor, inverter, with DC supply, with AC supply, without line supply, multisystem vehicles, dual mode vehicles, hybrid vehicles), non-electric drives
5. Brakes: basics, principles (wheel brakes, rail brakes, blending), brake control (requirements and operation modes, pneumatic brake, electropneumatic brake, emergency brake, parking brake)
6. Train control management system: definition of TCMS, bus systems, components, network architectures, examples, future trends
7. Vehicle concepts: trams, metros, regional trains, intercity trains, high speed trains, double deck vehicles, locomotives, freight wagons

**Organizational issues**

ab SS 2024 schriftliche Prüfung

**Literature**

Eine Literaturliste steht den Studierenden auf der Ilias-Plattform zum Download zur Verfügung.

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



### 3.313 Course: Railways in the Transportation Market [T-MACH-105540]

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

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2114914	<a href="#">Railways in the Transportation Market</a>	2 SWS	Block /	Cichon
Exams					
ST 2025	76-T-MACH-105540	<a href="#">Railways in the Transportation Market</a>			Cichon

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

Oral examination

Duration: ca. 20 minutes

No tools or reference materials may be used during the exam.

#### Prerequisites

none

#### Workload

120 hours

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



### Railways in the Transportation Market

2114914, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Block (B)  
On-Site**

#### 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 in Germany
- Overview of Deutsche Bahn
- Regulation of railways
- Financing and development of rail infrastructure
- Group strategy "Strong Rail" and their building blocks: (climate, environment, digitalization, "Strong Rail" in Baden-Württemberg)
- Trends in the transportation market
- Field of actions in transport policy
- Intra- and intermodal competition
- Summary

#### Learning Objectives:

- To capture the entrepreneurial perspective on transport companies
- To appraise the intra- and intermodal competition
- To understand the regulative determinant
- To reflect trends in transportation market
- To comprehend strategic challenges, chances and fields of actions of transport companies
- To apply intermodal perspective
- To take important key figures of railways and transportation market
- To realize the relevance of sustainability and digitalization

**Organizational issues**

Die Blockvorlesung „Die Eisenbahn im Verkehrsmarkt“ findet am **09./10./11.07.2025 von 9.00 bis 16.30 Uhr** am Campus Ost, Geb. 70.04, R 220 in Präsenz statt. Die Prüfung findet am 05.08.2025 im Geb. 70.04, R 008 in Präsenz statt.


Dozentin: Dr. Clarissa Freundorfer, Konzernbevollmächtigte der Deutsche Bahn AG für das Land Baden-Württemberg





Näheres siehe Homepage <http://www.fast.kit.edu/bst/929.php>

**Literature**

keine

**T****3.314 Course: Reactor Safety I: Fundamentals [T-MACH-105405]****Responsible:** Dr. Victor Hugo Sanchez-Espinoza**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
1

Events					
ST 2025	2189465	<a href="#">Reactor Safety I: Fundamentals</a>	2 SWS	Lecture / 	Sanchez-Espinoza
Exams					
WT 24/25	76-T-MACH-105405	<a href="#">Reactor Safety I: Fundamentals</a>			Sanchez-Espinoza
ST 2025	76-T-MACH-105405	<a href="#">Reactor Safety I: Fundamentals</a>			Sanchez-Espinoza

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam about 30 minutes

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Reactor Safety I: Fundamentals**2189465, SS 2025, 2 SWS, Language: German/English, [Open in study portal](#)**Lecture (V)**  
**On-Site**

**Content**

This lecture will be given in English, if required in German

The lecture discusses the fundamental principles and concepts of reactor safety including the methodologies for safety assessment and major accidents.

In the lecture, the fundamental principles and concepts of reactor safety are discussed. They facilitate the assessment of the safety status of nuclear power plants and the interpretation of incidents or accidents as such as Chernobyl or Fukushima. Starting with the explanations of the technical safety features of reactor systems, the safety concepts of different reactor types are discussed. The initiation and progression of incidents/accidents as well as the methods for the safety evaluation are also treated in the lecture. Discussing the Fukushima accident, the radiological risk from nuclear power plants together with the counter measures to stop severe accident and to limit the consequences will be explained. Finally, new development to increase the safety of reactors of Generation III and IV will be presented.

**Lecture Content:**

- National and international nuclear regulations
- Fundamental principles of reactor safety
- Implementation of safety principles in nuclear power plants of generation 2
- Methods for safety analysis and safety assessment
- Key physical phenomena during severe accidents determining radiological impact
- How to analyse reactor accidents with numerical simulation tools
- Discussion severe accidents e.g. the Fukushima accident

**Lernziele****Lecture Content:**

- National and international nuclear regulations
- Fundamental principles of reactor safety
- Implementation of safety principles in nuclear power plants of generation 2
- Safety analysis and methods for safety assessment
- Nuclear events and accidents and its evaluation methods
- Discussion severe accidents

Knowledge in energy technology, nuclear power plants, reactor physics, thermal hydraulic of nuclear reactors is welcomed

regular attendance: 30 h

self-study: 90 h

Zielgruppe: Students of Mechanical Engineering,

oral examination, duration approximately 30 minutes

**Organizational issues**

Mündliche Prüfung (Oral examination)

Anmeldung im ILIAS (Registration through ILIAS)





**Literature**

- A. Ziegler, Lehrbuch der Reaktortechnik Band 1 und 2, Springer Verlag, 1986
- D. Smidt, Reaktorsicherheitstechnik. Springer-Verlag Berlin Heidelberg New York. 1979
- D. Smidt, Reaktortechnik, Band 2, Verlag G. Braun, Karlsruhe, 1976
- G. Kessler et al; Risks of Nuclear Energy Technology- Safety Concepts of Light Water Reactors. Springer Verlag 2014.
- B. R. Sehgal; Nuclear Safety in LWR: Severe Accident Phenomenology. Academic Press Elsevier. 2012.
- John C. Lee and Norman J. McCormick. July; Risk and Safety Analysis of Nuclear Systems. 2011
- G. Petrangeli; Nuclear Safety. Elsevier Butterworth-Heinemann. 2006
- J. N. Lillington; Light Water Reactor Safety: The Development of Advanced Models and Codes for Light Water Reactor Safety Analysis. Elsevier 1995.



**T****3.315 Course: Renewable Energy-Resources, Technologies and Economics [T-WIWI-100806]****Responsible:** Prof. Dr. Patrick Jochem**Organisation:** KIT Department of Economics and Management**Part of:** [M-MACH-104884 - Courses of the KIT Department of Economics and Management](#)**Type**  
Written examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
7

Events					
WT 24/25	2581012	<a href="#">Renewable Energy – Resources, Technologies and Economics</a>	2 SWS	Lecture / 	Jochem
Exams					
WT 24/25	7981012	<a href="#">Renewable Energy-Resources, Technologies and Economics</a>			Fichtner

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

The assessment consists of a written exam (60 minutes, in English, answers are possible in German or English) (following §4(2) of the examination regulation). The exam takes place in every semester. Re-examinations are offered at every ordinary examination date. Depending on the respective pandemic situation, the exam may be offered as an open book exam (alternative exam assessment, following §4(2), 3 of the examination regulation).

**Prerequisites**

None.

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

**V****Renewable Energy – Resources, Technologies and Economics**2581012, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

1. General introduction: Motivation, Global situation
2. Basics of renewable energies: Energy balance of the earth, potential definition
3. Hydro
4. Wind
5. Solar
6. Biomass
7. Geothermal
8. Other renewable energies
9. Promotion of renewable energies
10. Interactions in systemic context
11. Excursion to the "Energieberg" in Mühlburg

**Learning Goals:**

The student

- understands the motivation and the global context of renewable energy resources.
- gains detailed knowledge about the different renewable resources and technologies as well as their potentials.
- understands the systemic context and interactions resulting from the increased share of renewable power generation.
- understands the important economic aspects of renewable energies, including electricity generation costs, political promotion and marketing of renewable electricity.
- is able to characterize and where required calculate these technologies.

**Organizational issues**

Blockveranstaltung, freitags 14:00-17:00 Uhr, 25.10., 08.11., 22.11., 06.12., 20.12., 17.01., 31.01. 14.02.

**Literature****Weiterführende Literatur:**

- Kaltschmitt, M., 2006, Erneuerbare Energien : Systemtechnik, Wirtschaftlichkeit, Umweltaspekte, aktualisierte, korrigierte und ergänzte Auflage Berlin, Heidelberg : Springer-Verlag Berlin Heidelberg.
- Kaltschmitt, M., Streicher, W., Wiese, A. (eds.), 2007, Renewable Energy: Technology, Economics and Environment, Springer, Heidelberg.
- Quaschnig, V., 2010, Erneuerbare Energien und Klimaschutz : Hintergründe - Techniken - Anlagenplanung – Wirtschaftlichkeit München : Hanser, Ill.2., aktualis. Aufl.
- Harvey, D., 2010, Energy and the New Reality 2: Carbon-Free Energy Supply, Eathscan, London/Washington.
- Boyle, G. (ed.), 2004, Renewable Energy: Power for a Sustainable Future, 2nd Edition, Open University Press, Oxford.



### 3.316 Course: Robotics I - Introduction to Robotics [T-INFO-108014]

**Responsible:** Prof. Dr.-Ing. Tamim Asfour  
**Organisation:** KIT Department of Informatics  
**Part of:** [M-MACH-104883 - Courses of the KIT Department of Informatics](#)

**Type**  
Written examination

**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	2424152	<a href="#">Robotics I - Introduction to Robotics</a>		Lecture / 🗎	Asfour, Daab, Hyseni
Exams					
WT 24/25	7500106	<a href="#">Robotics I - Introduction to Robotics</a>			Asfour

Legend: 🗎 Online, 🔄 Blended (On-Site/Online), 🗎 On-Site, ✕ Cancelled

#### Competence Certificate

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 120 minutes.

#### Prerequisites

none.

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



#### Robotics I - Introduction to Robotics

2424152, WS 24/25, SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

The lecture provides an overview of the fundamentals of robotics using the examples of industrial robots, service robots and autonomous humanoid robots. An insight into all relevant topics is given. This includes methods and algorithms for robot modeling, control and motion planning, image processing and robot programming. First, mathematical basics and methods for kinematic and dynamic robot modeling, trajectory planning and control as well as algorithms for collision-free motion planning and grasp planning are covered. Subsequently, basics of image processing, intuitive robot programming especially by human demonstration and symbolic planning are presented.

In the exercise, the theoretical contents of the lecture are further illustrated with examples. Students deepen their knowledge of the methods and algorithms by independently working on problems and discussing them in the exercise. In particular, students can gain practical programming experience with tools and software libraries commonly used in robotics.

#### Workload:

Lecture with 3 SWS + 1 SWS Tutorial, 6 LP

6 LP corresponds to 180 hours, including

15 \* 3= 45 hours attendance time (lecture)

15 \* 1= 15 hours attendance time (tutorial)

15 \* 6= 90 hours self-study and exercise sheets

30 hours preparation for the exam

#### Competency Goals:

The students are able to apply the presented concepts to simple and realistic tasks from robotics. This includes mastering and deriving the mathematical concepts relevant for robot modeling. Furthermore, the students master the kinematic and dynamic modeling of robot systems, as well as the modeling and design of simple controllers. The students know the algorithmic basics of motion and grasp planning and can apply these algorithms to problems in robotics. They know algorithms from the field of image processing and are able to apply them to problems in robotics. They are able to model and solve tasks as a symbolic planning problem. The students have knowledge about intuitive programming procedures for robots and know procedures for programming and learning by demonstration.

#### Organizational issues

Die Erfolgskontrolle erfolgt in Form einer schriftlichen Prüfung im Umfang von i.d.R. 120 Minuten nach § 4 Abs. 2 Nr. 1 SPO.

**Modul für Bachelor/Master Informatik, Maschinenbau, Mechatronik und Informationstechnik, Elektrotechnik und Informationstechnik**

**Literature**

**Weiterführende Literatur**

Fu, Gonzalez, Lee: Robotics - Control, Sensing, Vision, and Intelligence

Russel, Norvig: Artificial Intelligence - A Modern Approach, 2nd. Ed.

T

**3.317 Course: Robotics II - Humanoid Robotics [T-INFO-105723]**

**Responsible:** Prof. Dr.-Ing. Tamim Asfour  
**Organisation:** KIT Department of Informatics  
**Part of:** [M-MACH-104883 - Courses of the KIT Department of Informatics](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	3	Grade to a third	Each summer term	4

Events					
ST 2025	2400074	<a href="#">Robotics II: Humanoid Robotics</a>	2 SWS	Lecture / 🗎	Asfour
Exams					
WT 24/25	7500211	<a href="#">Robotics II: Humanoid Robotics</a>			Asfour

Legend: 🗎 Online, 🗎 Blended (On-Site/Online), 🗎 On-Site, ✕ Cancelled

**Competence Certificate**

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 60 minutes.

**Recommendation**

Having visited the lectures on Robotics I - Introduction to Robotics and Mechano-Informatics and Robotics is recommended.

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

V

**Robotics II: Humanoid Robotics**

2400074, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)  
On-Site**

**Content**

The lecture presents current work in the field of humanoid robotics, which deals with the implementation of complex sensorimotor and cognitive abilities. Various methods and algorithm, their advantages and disadvantages, as well as the current state of research are discussed.

The following topics are covered: Applications and real world examples of humanoid robots; biomechanical models of the human body, biologically inspired and data-driven methods of grasping, imitation learning and programming by demonstration; semantic representations of sensorimotor experience as well as cognitive software architectures of humanoid robots

**Learning Objectives:**

The students have an overview of current research topics in the field of cognitive and learning robotics using the example of humanoid robotics and are able to categorize and assess current developments in the field of cognitive humanoid robotics.

Students are familiar with the main problem areas of cognitive humanoid robotics and are able to develop solutions on the basis of existing research work.

**Organizational issues**

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) of, in general, 60 minutes.

Workload: 90 h

Recommendations: *Having visited the lectures on Robotics I – Introduction to Robotics and Mechano-Informatics and Robotics is recommended.*

Intended audience: **Module for Mechanical Engineering Master, Mechatronics and Information Technology Master, Electrical Engineering and Information Technology Master**

**Literature****Additional literature**

Scientific publications on the topic are made available on the lecture website.

**3.318 Course: Robotics III - Sensors and Perception in Robotics [T-INFO-109931]**

**Responsible:** Prof. Dr.-Ing. Tamim Asfour  
**Organisation:** KIT Department of Informatics  
**Part of:** [M-MACH-104883 - Courses of the KIT Department of Informatics](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	3	Grade to a third	Each summer term	2

Events					
ST 2025	2400067	<a href="#">Robotics III - Sensors and Perception in Robotics</a>	2 SWS	Lecture /	Asfour
Exams					
WT 24/25	7500207	<a href="#">Robotics III - Sensors and Perception in Robotics</a>			Asfour

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 60 minutes.

**Prerequisites**

none.

**Recommendation**

Attending the lecture Robotics I – Introduction to Robotics is recommended.

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

**Robotics III - Sensors and Perception in Robotics**

2400067, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
On-Site

**Content**

The lecture complements the lecture Robotics I and provides a broad overview of sensors and perception methods used in robotics. The focus is on visual perception, semantic scene interpretation, simultaneous localization and mapping (SLAM) as well as haptic exploration and active perception. The lecture is divided into two parts:

In the first part a comprehensive overview of current sensor technologies is given. A fundamental distinction is made between sensors for the perception of the environment (exteroceptive) and sensors for the perception of the internal state (proprioceptive). The second part of the lecture focuses on the use of exteroceptive sensors in robotics. The topics include tactile exploration and visual data processing, including the basics of feature extraction, segmentation, semantic scene interpretation, simultaneous localization and mapping (SLAM) as well as haptic exploration and active perception.

**Learning Objectives:**

Students can name the main sensor principles used in robotics. They can explain the data flow from physical measurement through digitization to the use of the measured sensor data for feature extraction, state estimation and semantic scene understanding.

Students are able to propose and justify suitable sensor concepts for robotic tasks.

**Organizational issues**

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) of, in general, 60 minutes.

**Module for Mechanical Engineering Master, Mechatronics and Information Technology Master, Electrical Engineering and Information Technology Master, Mechatronics and Information Technology Bachelor**

Recommendations: **Having visited the lectures on Robotics I – Introduction to Robotics is recommended.**

Workload: 90 h

**Literature**

Lecture slides will be provided during the course.

Accompanying literature references regarding the individual topics of the lecture will be provided.

**3.319 Course: Safety Engineering [T-MACH-105171]****Responsible:** Hans-Peter Kany**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
2

Events					
WT 24/25	2117061	<a href="#">Safety Engineering</a>	2 SWS	Lecture /	Kany

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**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

**Workload**

120 hours

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

**Safety Engineering**2117061, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content****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.

**Learning goals**

The students are able to:

- Name and describe relevant safety concepts of safety engineering,
- Discuss basics of health at work and labour protection in Germany,
- Evaluate the basics for the safe methods of design of machinery with the national and European safety regulations and
- Realize these objectives by using examples in the field of storage and material handling systems.

**Recommendations**

None

**Workload**

Regular attendance: 21 hours

Self-study: 99 hours

**Organizational issues**

Termine: siehe ILIAS.

**Literature**

Defren/Wickert: Sicherheit für den Maschinen- und Anlagenbau, Druckerei und  
Verlag: H. von Ameln, Ratingen



### 3.320 Course: Scaling in Fluid Dynamics [T-MACH-105400]

**Responsible:** apl. Prof. Dr. Leo Bühler

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2154044	<a href="#">Scaling in fluid dynamics</a>	2 SWS	Lecture /	Bühler
Exams					
WT 24/25	76-T-MACH-105400	<a href="#">Scaling in Fluid Dynamics</a>			Bühler

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

Oral exam

Duration: 20-30 minutes

No auxiliary means

#### Prerequisites

none

#### Recommendation

Fluid Mechanics (T-MACH-105207)

#### Workload

120 hours

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



### Scaling in fluid dynamics

2154044, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Content

- Introduction
- Similarity rules (examples)
- Dimensional analysis (Pi-theorem)
- Scaling in differential equations
- Scaling in boundary layers
- Self-similar solutions
- Scaling in turbulent shear layers
- Rotating flows
- Magnetohydrodynamic flows

**Educational objective:** The student can extract non-dimensional number from the characteristic properties of flows. From the insights on scaling laws, the students are qualified to identify the influencing quantities from generic experiments and transfer these to real applications. The students can simplify the governing equations of fluid mechanic appropriately and can interpret the achieved results as a basis for efficient solution strategies.

#### Literature

G. I. Barenblatt, 1979, Similarity, Self-Similarity, and Intermediate Asymptotics, Plenum Publishing Corporation (Consultants Bureau)

J. Zierep, 1982, Ähnlichkeitsgesetze und Modellregeln der Strömungsmechanik, Braun

J. H. Spurk, 1992, Dimensionsanalyse in der Strömungslehre, Springer



**T****3.321 Course: Selected Chapters of the Combustion Fundamentals [T-MACH-105428]****Responsible:** Prof. Dr. Ulrich Maas**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1**Competence Certificate**

Oral exam, approx. 20 min


**Prerequisites**





none

**Workload**

120 hours

**T****3.322 Course: Selected Problems of Applied Reactor Physics and Exercises [T-MACH-105462]****Responsible:** apl. Prof. Dr. Ron Dagan**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
1

Events					
ST 2025	2190411	<a href="#">Selected Problems of Applied Reactor Physics and Exercises</a>	2 SWS	Lecture / 	Dagan, Metz
Exams					
WT 24/25	76-T-MACH-105462	<a href="#">Selected Problems of Applied Reactor Physics and Exercises</a>			Dagan, Metz
ST 2025	76-T-MACH-105462	<a href="#">Selected Problems of Applied Reactor Physics and Exercises</a>			Dagan

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, approx. 1/2 hour

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Selected Problems of Applied Reactor Physics and Exercises**2190411, SS 2025, 2 SWS, Language: German/English, [Open in study portal](#)**Lecture (V)**  
**On-Site****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

**The students**

- have solid understanding of the basic reactor physics
- are able to estimate processes of growth and decay of radionuclides; out of it, they can perform dose calculation and introduce their biological hazards
- can calculate the relationship of basic parameters which are needed for a stable reactor operation
- understand important dynamical processes of nuclear reactors.

Regular attendance: 26 h

self study 94 h

oral exam about 30 min.

**Literature**

K. Wirtz Grundlagen der Reaktortechnik Teil I, II, Technische Hochschule Karlsruhe 1966

D. Emendorfer. K.H. Höcker Theorie der Kernreaktoren, BI- Hochschultaschenbücher 1969

J. Duderstadt and L. Hamilton, Nuclear reactor Analysis, J. Wiley &amp; Sons, Inc. 1975 (in English)

T

**3.323 Course: Self-Booking-MSc-HOC-SPZ-FORUM-Graded [T-MACH-111687]****Responsible:** Prof. Dr.-Ing. Bettina Frohnapfel**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106255 - Key Competencies](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	2	Grade to a third	Each term	1

**Competence Certificate**

Completed coursework

**Prerequisites**

None

**Self service assignment of supplementary studies**

This course can be used for self service assignment of grade acquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)

**Annotation**

Interdisciplinary qualifications (IQ) completed at the House-of-Competence (HoC), at the Zentrum für Angewandte Kulturwissenschaften (ZAK) or at the Sprachenzentrum (SpZ) can be assigned in self-service.

First, select a partial accomplishment named "self-assignment" in your study schedule and second, assign an IQ-achievement via the tab "IQ achievements".

**Workload**

60 hours

T

**3.324 Course: Self-Booking-MSc-HOC-SPZ-FORUM-Non-Graded [T-MACH-111686]****Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106255 - Key Competencies](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each term	1

**Competence Certificate**

Completed coursework

**Prerequisites**

None

**Self service assignment of supplementary studies**

This course can be used for self service assignment of grade acquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)

**Annotation**

Interdisciplinary qualifications (IQ) completed at the House-of-Competence (HoC), at the Zentrum für Angewandte Kulturwissenschaften (ZAK) or at the Sprachenzentrum (SpZ) can be assigned in self-service.

First, select a partial accomplishment named "self-assignment" in your study schedule and second, assign an IQ-achievement via the tab "IQ achievements".

**Workload**

60 hours


**T****3.325 Course: Seminar in Materials Science [T-MACH-100290]**





**Responsible:** Dr. Patric Gruber  
Dr. rer. nat. Stefan Wagner

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each summer term	2

Events					
ST 2025	2178450	<a href="#">Seminar in Materials Science</a>	2 SWS	Seminar / 	Gruber, Wagner
Exams					
ST 2025	76-T-MACH-100290	<a href="#">Seminar in Materials Science</a>			Gruber, Wagner

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Attendance on all seminars

Preparation of an oral talk (meeting with mentor)

Presentation of oral talk

**Prerequisites**

Materials Physics, Metals, basics in Ceramics

**Workload**

60 hours

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

**V****Seminar in Materials Science**

2178450, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Seminar (S)**  
**On-Site**

**Content**

Topics in materials science within the framework of the lectures Materials Physics, Metals and Introduction to Ceramics.

The students are able to work target- and resources-oriented on a scientific case in the field of material science under specified conditions. They are able to research and select scientific and technical informations according to set criteria. The students are able to prepare and present the scientific case in a clear and convincing manner in an oral presentation.

**Organizational issues**

Die Vorbesprechung zum Seminar findet am 22.04.2024 zum Seminartermin statt.

**Literature**

Themenspezifisch

T

**3.326 Course: Seminar Novel Concepts for Solar Energy Harvesting [T-ETIT-108344]****Responsible:** Prof. Dr. Bryce Sydney Richards**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each summer term	2

**Competence Certificate**

The examination consists of a written journal article and an oral presentation of the student's work, both given in English. The overall impression is rated.


**Prerequisites**




none

T

**3.327 Course: Sensors [T-ETIT-101911]****Responsible:** Dr. Wolfgang Menesklou**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	3	Grade to a third	Each summer term	2

Events					
ST 2025	2304231	<a href="#">Sensors</a>	2 SWS	Lecture / 	Menesklou
Exams					
WT 24/25	7304231	<a href="#">Sensors</a>			Menesklou
ST 2025	7304231	<a href="#">Sensors</a>			Menesklou

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

## T

**3.328 Course: Simulation of Coupled Systems [T-MACH-105172]****Responsible:** Prof. Dr.-Ing. Marcus Geimer**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	2

Exams				
WT 24/25	76T-MACH-105172	<a href="#">Simulation of Coupled Systems</a>	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 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.

**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 knowledge of Matlab/Simulink
- Basic knowledge of dynamics of machines
- 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 hydraulics 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

**Workload**

120 hours



**T****3.329 Course: Simulation of Coupled Systems - Advance [T-MACH-108888]****Responsible:** Prof. Dr.-Ing. Marcus Geimer**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	0	pass/fail	Each summer term	1

**Competence Certificate**

Preparation of semester report

**Prerequisites**

none

## T


**3.330 Course: Simulator Exercises Combined Cycle Power Plants [T-MACH-105445]**





**Responsible:** Prof. Dr.-Ing. Daniel Banuti  
Hon.-Prof. Dr. Thomas Schulenberg

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	2	Grade to a third	Each summer term	1

Events					
ST 2025	2170491	<a href="#">Simulator Exercises Combined Cycle Power Plants</a>	2 SWS	Practical course / 	Banuti, Schulenberg
Exams					
WT 24/25	76-T-MACH-105445	<a href="#">Simulator Exercises Combined Cycle Power Plants</a>	Banuti, Schulenberg		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam (ca. 15 min)

**Prerequisites**

none

**Recommendation**

Participation at LV-No. 2170490 "Combined Cycle Power Plants" (T-MACH-105444) is recommended.

**Workload**

60 hours

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

## V

**Simulator Exercises Combined Cycle Power Plants**

2170491, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Practical course (P)**  
**On-Site**

**Content**

The training objective of the course is the qualification for a research-related professional activity in power plant engineering. On the basis of the learned fundamentals in thermodynamics, in instrumentation and control engineering, as well as on the basis of the acquired knowledge of design of combined cycle plants, the participants can operate a real combined cycle power plant. This application creates a deeper understanding of the dynamic processes of the power plant, the specific importance of the plant components and the limits of the load capacity of the components. Participants can optimize normal operation and analyze incidents. They can work self-organized and reflexive. They have communicative and organizational skills in teamwork, even under major technical challenges.

Start-up of the power plant from scratch; load changes and shut down; dynamic response of the power plant in case of malfunctions and of sudden load changes; manual operation of selected components.

**Organizational issues**

Termine zum Simulatorpraktikum werden in der Vorlesung und per ILIAS am Semesterbeginn mit den Studenten vereinbart.

Appointments for the simulator internship are arranged with the students in the lecture and via ILIAS at the beginning of the semester.



**Literature**





Vorlesungsskript und weitere Unterlagen der Vorlesung Gas- und Dampfkraftwerke.

Slides and other documents of the lecture Combined Cycle Power Plants.

## T

**3.331 Course: Solar Energy [T-ETIT-100774]****Responsible:** Prof. Dr. Bryce Sydney Richards**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2313745	<a href="#">Solar Energy</a>	3 SWS	Lecture / 	Richards, Paetzold
WT 24/25	2313750	<a href="#">Tutorial 2313745 Solar Energy</a>	1 SWS	Practice / 	Richards, Paetzold
Exams					
WT 24/25	7313745	<a href="#">Solar Energy</a>	Richards, Paetzold		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Prerequisites**

Students not allowed to take either of the following modules in addition to this one: „Solarenergie“ (M-ETIT-100476) and „Photovoltaik“ (M-ETIT-100513).


**Modeled Conditions**





The following conditions have to be fulfilled:

1. The course [T-ETIT-101939 - Photovoltaics](#) must not have been started.

## T

**3.332 Course: Solar Thermal Energy Systems [T-MACH-106493]****Responsible:** apl. Prof. Dr. Ron Dagan**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
4

Events					
WT 24/25	2189400	<a href="#">Solar Thermal Energy Systems</a>	2 SWS	Lecture / 	Dagan
Exams					
WT 24/25	76-T-MACH-106493	<a href="#">Solar Thermal Energy Systems</a>			Dagan
ST 2025	76-T-MACH-106493	<a href="#">Solar Thermal Energy Systems</a>			Dagan

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam of about 30 minutes

**Prerequisites**

none

**Recommendation**

Literature

1. "Solar Engineering of Thermal Processes", 4th Edition, J. Duffie & W. Beckman. Published by Wiley & Sons
2. "Heat Transfer", 10th Edition, J. P. Holman. Mc. Graw Hill publisher
3. "Fundamentals of classical Thermodynamics", G. Van Wylen & R. E. Sonntag. Published by Wiley & Sons

**Workload**

120 hours

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

## V

**Solar Thermal Energy Systems**2189400, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**On-Site**

**Content**

The course deals with fundamental aspects of solar energy

1. Introduction to solar energy – global energy panorama
2. Solar energy resource-  
Structure of the sun, Black body radiation, solar constant, solar spectral distribution  
Sun-Earth geometrical relationship
3. Passive and active solar thermal applications.
4. Solar thermal systems- solar collector-types, concentrating collectors, solar towers,  
Heat losses, efficiency
5. Selected topics on thermodynamics and heat transfer which are relevant for solar systems.
6. Introduction to Solar induced systems: Wind , Heat pumps, Biomass , Photovoltaic
7. 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.

The students get familiar with the global energy demand and the role of renewable energies learn about improved designs for using efficiently the potential of solar energy gain basic understanding of the main thermal hydraulic phenomena which support the work on future innovative applications will be able to evaluate quantitatively various aspects of the thermal solar systems.

Total 120 h, hereof 30 h contact hours and 90 h homework and self-studies

oral exam about 30 min.

**Organizational issues**

Die Vorlesung "Thermische Solarenergie" findet ab dem WS 2024/25 nicht mehr statt. Sie wurde zusammengelegt mit der engl. Version "Solar Thermal Energy Systems"

**Literature**

- "Solar Engineering of Thermal Processes "4th Edition, J. Duffie & W. Beckman. Published by Wiley & Sons.
- "Heat Transfer", 10th Edition, P. Holman Mc. Graw Hill publisher.
- "Fundamentals of classical Thermodynamics", G. Van Wylen & R. E. Sonntag. Published by Wiley & Sons


**T****3.333 Course: Solid State Reactions and Kinetics of Phase [T-MACH-107667]**





**Responsible:** Dr. Peter Franke  
Prof. Dr. Hans Jürgen Seifert

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	4

Events					
WT 24/25	2193003	<a href="#">Solid State Reactions and Kinetics of Phase Transformations</a>	2 SWS	Lecture / 	Franke
Exams					
WT 24/25	76-T-MACH-107667	<a href="#">Solid State Reactions and Kinetics of Phase</a>	Seifert, Franke		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral examination (about 30 min)

**Prerequisites**

The successful participation in Übungen zu Festkörperreaktionen / Kinetik von Phasenumwandlungen, Korrosion is the condition for the admittance to the oral exam in Festkörperreaktionen / Kinetik von Phasenumwandlungen, Korrosion.

T-MACH-110926 – Exercises for Solid State Reactions and Kinetics of Phase Transformations has not been started.

T-MACH-110927 – Solid State Reactions and Kinetics of Phase has not been started.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-107632 - Exercises for Solid State Reactions and Kinetics of Phase Transformations](#) must have been passed.

**Recommendation**

Basic course in materials science and engineering

Basic course in mathematics

physical chemistry

**Workload**

120 hours

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

**V****Solid State Reactions and Kinetics of Phase Transformations**

2193003, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

Oral examination (about 30 min)

Teaching Content:

1. Crystal Defects and Mechanisms of Diffusion
2. Microscopic Description of Diffusion
3. Phenomenological Treatment
4. Diffusion Coefficients
5. Diffusion Problems; Analytical Solutions
6. Diffusion with Phase Transformation
7. Kinetics of Microstructural Transformations
8. Diffusion at Surfaces, Grain Boundaries and Dislocations
9. Numerical treatment of diffusion controlled phase transformations

Recommendations:

knowledge of the course "Fundamentals in Materials Thermodynamics and Heterogeneous Equilibria" (Seifert); Basic course in materials science and Engineering; Basic course in mathematics; physical chemistry

regular attendance: 22 hours

self-study: 98 hours


The students acquire knowledge about:





- diffusion mechanisms
- Fick's laws
- basic solutions of the diffusion equation
- evaluation of diffusion experiments
- interdiffusion processes
- the thermodynamic factor
- parabolic growth of layers
- formation of pearlite
- microstructural transformations according to the models of Avrami and Johnson-Mehl
- TTT diagrams

**Literature**

1. J. Crank, "The Mathematics of Diffusion", 2nd Ed., Clarendon Press, Oxford, 1975.
2. J. Philibert, "Atom Movements", Les Éditions de Physique, Les Ulis, 1991.
3. D.A. Porter, K.E. Easterling, M.Y. Sherif, "Phase Transformations in Metals and Alloys", 3rd edition, CRS Press, 2009.
4. H. Mehrer, "Diffusion in Solids", Springer, Berlin, 2007.

**T****3.334 Course: Strategic Product Development - Identification of Potentials of Innovative Products [T-MACH-105696]****Responsible:** Prof. Dr.-Ing. Andreas Siebe**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
2

Events					
ST 2025	2146198	<a href="#">Strategic product development - identification of potentials of innovative products</a>	2 SWS	Lecture / 	Siebe
Exams					
ST 2025	76-T-MACH-105696	<a href="#">Strategic product development - identification of potentials of innovative products</a>			Siebe, Albers

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral exam in small groups (30 minutes)

**Prerequisites**

The precondition of this partial work is the successful processing of a case study(T-MACH-110396): Documentation and presentation of the overall results (15 minutes)

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-MACH-110396 - Strategic Product Development - Identification of Potentials of Innovative Products - Case Study](#) must have been passed.

**Workload**

90 hours

*Below you will find excerpts from events related to this course:***V****Strategic product development - identification of potentials of innovative products**2146198, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)  
Blended (On-Site/Online)****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.

**Organizational issues**

Anmeldung erforderlich; Termine/ Ort und weitere Informationen siehe IPEK-Homepage




**T****3.335 Course: Strategic Product Development - Identification of Potentials of Innovative Products - Case Study [T-MACH-110396]**





**Responsible:** Prof. Dr.-Ing. Albert Albers  
 Prof. Dr.-Ing. Sven Matthiesen  
 Prof. Dr.-Ing. Andreas Siebe

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	1	Grade to a third	Each summer term	2

Events					
ST 2025	2146198	<a href="#">Strategic product development - identification of potentials of innovative products</a>	2 SWS	Lecture / 	Siebe
Exams					
ST 2025	76-T-MACH-110396	<a href="#">Strategic Product Development - Identification of Potentials of Innovative Products - Case Study</a>			Siebe

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Successful processing of a case study(T-MACH-110396): documentation and presentation of the overall results (15 minutes)

**Workload**

30 hours

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

**V****Strategic product development - identification of potentials of innovative products**

2146198, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)  
Blended (On-Site/Online)**

**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.

**Organizational issues**

Anmeldung erforderlich; Termine/ Ort und weitere Informationen siehe IPEK-Homepage

## T

**3.336 Course: Structural Analysis of Composite Laminates [T-MACH-105970]****Responsible:** Prof. Dr.-Ing. Luise Kärger**Organisation:** KIT Department of Mechanical Engineering  
Lightweight Design**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
2

Events					
WT 24/25	2113106	<a href="#">Structural Analysis of Composite Laminates</a>	2 SWS	Lecture / Practice ( / )	Kärger
Exams					
WT 24/25	76-T-MACH 105970	<a href="#">Structural Analysis of Composite Laminates</a>			Kärger
ST 2025	76-T-MACH-105970	<a href="#">Structural Analysis of Composite Laminates</a>			Kärger

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam, 20 min

**Prerequisites**

T-MACH-114003 and T-MACH-114005 must not have been started.

**Workload**

120 hours

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

## V

**Structural Analysis of Composite Laminates**2113106, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture / Practice (VÜ)**  
**On-Site****Content**

To reduce fuel consumption and CO<sub>2</sub> emissions, lightweight materials such as fiber-reinforced plastics (FRP) are increasingly being used in vehicle construction. The course is dedicated to the calculation of the material and structural behavior of FRP components with the following contents:

- Micromechanics and homogenization of fibre-matrix-composite
- Macromechanical behavior of individual layer
- Behaviour of multilayer laminate
- FE formulations
- Failure criteria
- Damage analysis
- Dimensioning of FRP parts

**Aim of this lecture:** The students can explain the mechanical correlation between fibre-matrix-configuration and macroscopic material behavior. They are able to formulate the stress-strain / force-strain relation of an individual layer and of a multilayer laminate by approaches of first and higher order. The students can name, evaluate, and apply failure criteria and approaches to model damage progression. They can name and explain simple dimension strategies to design FRP components.

**Literature**

H. Altenbach, J. Altenbach, and R. Rikards: Einführung in die Mechanik der Laminat- und Sandwichtragwerke. Deutscher Verlag für Grundstoffindustrie, Stuttgart, 1. edition, 1996.

Henning, F.; Moeller, E.: Handbuch Leichtbau: Methoden, Werkstoffe, Fertigung. Carl Hanser Verlag GmbH & Co. KG, 2011

A. Puck: Festigkeitsanalyse von Faser-Matrix-Laminaten, Modelle für die Praxis. Carl Hanser Verlag, München, Wien, 1. edition, 1996.

H. Schürmann: Konstruieren mit Faserverbundwerkstoffen. ISBN 3-540-40283-7. Springer Verlag, 2005.

**englischsprachige Literatur:**

H. Altenbach, J. Altenbach, W. Kissing; Mechanics of Composite Structural Elements . ISBN 978-3-642-07411-0 Springer-Verlag Berlin Heidelberg, 2004.

E. J. Barbero: Finite Element Analysis of Composite Materials. ISBN: 1-4200-5433-3 . CRC Press, Boca Raton, FL, 1. edition, 2008.

E. J. Barbero: Introduction to Composite Materials Design. CRC Press, Boca Raton, FL, 2. edition, 2011.

E. J. Barbero: Finite Element Analysis of Composite Materials Using Abaqus. ISBN: ISBN: 978-1-46-651661-8 . CRC Press, Boca Raton, FL, 2013.

Isaac M. Daniel, Ori Ishai: Engineering Mechanics of Composite Materials. Oxford Univ Press; ISBN-13: 978-0195150971 , 2. Edition, 2005.

Davila, C. G.; Camanho, P. P.; Rose, C. A.: Failure criteria for FRP laminates. Journal of Composite Materials 39: 323-345, 2005.

Hinton, M. J.; Kaddour, A. S.; Soden, P. D.: A comparison of the predictive capabilities of current failure theories for composite laminates, judged against experimental evidence. Composites Science and Technology 62: 1725-1797, 2002.

Puck, A.; Schürmann, H.: Failure analysis of FRP laminates by means of physically based phenomenological models. Composite Science and Technology 58: 1045-1067, 1998.

Reddy, J. N.: Mechanics of laminated composite plates and shells - Theory and Analysis. USA: CRC Press, Boca Raton, 2004.

Soden, P. D.; Kaddour, A. S.; Hinton, M. J.: Recommendations for designers and researchers resulting from the world-wide failure exercise. Composites Science and Technology 64: 589-604, 2004.

Stephen W. Tsai and J. Daniel D. Melo: Composite Materials Design and Testing. Composites Design Group, 978-0-9860845-1-5 Stanford University , 2015.



### 3.337 Course: Structural Materials [T-MACH-100293]

**Responsible:** Dr.-Ing. Stefan Guth

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
3

Events					
WT 24/25	2174580	<a href="#">Structural Materials</a>	4 SWS	Lecture / Practice ( /  )	Guth
Exams					
WT 24/25	76-T-MACH-100293	<a href="#">Structural Materials</a>			Guth
ST 2025	76-T-MACH-100293	<a href="#">Structural Materials</a>			Guth

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

Oral exam, about 25 minutes

#### Prerequisites

none

#### Workload

180 hours

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



#### Structural Materials

2174580, WS 24/25, 4 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)**  
**On-Site**

#### Content

Lectures and tutorials on the topics:

- basic loading types and superimposed loadings
- high-temperature loading
- influence of notches
- uniaxial, multiaxial and superimposed cyclic loading
- notch fatigue
- structural durability
- impact of residual stresses
- basic principles of materials selection
- dimensioning of components

#### learning objectives:

The students are able to select materials for mechanical design and to dimension structural components according to the state of the art. They are familiar with the most important engineering materials. They can assess these materials on base of their characteristic properties and and they can match property profiles and requirement profiles. The dimensioning includes complex situations, such as multiaxial loading, notched components, static and dynamic loading, componetns with residual stresses and loading at high homologous temperatures.

#### requirements:

none



#### workload:





Precence: 42h

Self study: 138h

**T****3.338 Course: Superconductors for Energy Applications [T-ETIT-110788]****Responsible:** apl. Prof. Dr. Francesco Grilli**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	5	Grade to a third	Each winter term	1 terms	2

Events					
WT 24/25	2312704	<a href="#">Superconductors for Energy Applications</a>	2 SWS	Lecture / 	Grilli
WT 24/25	2312705	<a href="#">Übungen zu 2312704 Superconductors for Energy Applications</a>	1 SWS	Practice / 	Grilli
Exams					
WT 24/25	7300015	<a href="#">Superconductors for Energy Applications</a>	Grilli		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**


oral exam approx. 30 minutes.





**Prerequisites**

A basic knowledge of electromagnetism and thermodynamics is the only requirement. Previous knowledge of superconductivity is not necessary.

"T-ETIT-106970 - Superconducting Materials for Energy Applications" must not be taken.

**T****3.339 Course: Superhard Thin Film Materials [T-MACH-102103]****Responsible:** Prof. Sven Ulrich**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
3

Events					
WT 24/25	2177618	<a href="#">Superhard Thin Film Materials</a>	2 SWS	Lecture / 	Ulrich
Exams					
WT 24/25	76-T-MACH-102103	<a href="#">Superhard Thin Film Materials</a>			Ulrich
ST 2025	76-T-MACH-102103	<a href="#">Superhard Thin Film Materials</a>			Ulrich

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral examination (ca. 30 Minuten)

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Superhard Thin Film Materials**2177618, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site**

**Content**

oral examination (about 30 min), no tools or reference materials

Teaching Content:

Introduction

Basics

Plasma diagnostics

Particle flux analysis

Sputtering and ion implantation

Computer simulations

Properties of materials, thin film deposition technology,  
thin film analysis and modelling of superhard materials

Amorphous hydrogenated carbon

Diamond like carbon

Diamond

Cubic Boronnitride

Materials of the system metall-boron-carbon-nitrogen-silicon

regular attendance: 22 hours

self-study: 98 hours

Superhard materials are solids with a hardness higher than 4000 HV 0,05. The main topics of this lecture are modelling, deposition, characterization and application of superhard thin film materials.

Recommendations: none

**Organizational issues**

Falls die Vorlesung online stattfinden muss, bitte um Anmeldung unter [sven.ulrich@kit.edu](mailto:sven.ulrich@kit.edu) bis zum 22.10.24.

Den entsprechenden MS Teams Link erhalten Sie dann per E-Mail am 23.10.24.

**Literature**

G. Kienel (Herausgeber): Vakuumbeschichtung 1 - 5, VDI Verlag, Düsseldorf, 1994


Abbildungen und Tabellen werden verteilt; Copies with figures and tables will be distributed





**T****3.340 Course: Sustainable Product Engineering: Sustainable Product Design - Long-term Business Success with Sustainably Developed Products [T-MACH-114033]**

**Responsible:** Dr.-Ing. Karl-Friedrich Ziegahn  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2146193	<a href="#">Sustainable Product Engineering</a>	2 SWS	Lecture / 	Ziegahn
Exams					
ST 2025	76-T-MACH-114033	<a href="#">Sustainable Product Engineering</a>	Ziegahn		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam (90 min)

**Prerequisites**

none

**Recommendation**

None

**Workload**

120 hours

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

**V****Sustainable Product Engineering**

2146193, SS 2025, 2 SWS, [Open in study portal](#)

**Lecture (V)**  
On-Site

**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 simulation during the process of development of technical products

delivery of key skills such as team skills / project / self / presentation based on realistic projects




The goal of the lecture is to convey the main elements of sustainable product development in the economic, social and ecological context.





The students are able to ...

- identify und describe the 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.
- discuss the skills for life-cycle product design using the example of complex automotive components such as airbag systems and other current products.
- understand the 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 simulation during the process of development of technical products.
- develop skills such as team skills / project / self / presentation based on realistic projects.



**T****3.341 Course: System Dynamics and Control Engineering [T-ETIT-101921]****Responsible:** Prof. Dr.-Ing. Sören Hohmann**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
2

Events					
WT 24/25	2303155	<a href="#">Systemdynamik und Regelungstechnik</a>	2 SWS	Lecture / 	Hohmann
WT 24/25	2303156	<a href="#">Tutorien zu 2303155 Systemdynamik und Regelungstechnik</a>		Tutorial ( / 	Piscol
WT 24/25	2303157	<a href="#">Übungen zu 2303155 Systemdynamik und Regelungstechnik</a>	1 SWS	Practice / 	Piscol
Exams					
WT 24/25	7303155	<a href="#">System Dynamics and Control Engineering</a>			Hohmann

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Prerequisites**

none

**3.342 Course: System Integration in Micro- and Nanotechnology [T-MACH-105555]****Responsible:** apl. Prof. Dr. Ulrich Gengenbach**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2106033	<a href="#">System Integration in Micro- and Nanotechnology I</a>	2 SWS	Lecture /	Gengenbach
Exams					
WT 24/25	76-T-MACH-105555	<a href="#">System Integration in Micro- and Nanotechnology</a>			Gengenbach

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam (Duration: 30 min)

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***System Integration in Micro- and Nanotechnology I**2106033, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content****Content:**

- Introduction to system integration (fundamentals)
- Brief introduction to MEMS processes
- Flexures
- Surfaces and plasma processes for surface treatment
- Adhesive bonding in engineering
- Mounting techniques in electronics
- Molded Interconnect devices (MID)
- Functional Printing
- Low temperature cofired ceramics in system integration


**Learning objectives:**





The students acquire basic knowledge of challenges and system integration technologies from mechanical engineering, precision engineering and electronics.

**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****3.343 Course: System Integration in Micro- and Nanotechnology 2 [T-MACH-110272]****Responsible:** apl. Prof. Dr. Ulrich Gengenbach**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2105040	<a href="#">System Integration in Micro- and Nanotechnology 2</a>	2 SWS	Lecture / 	Gengenbach
Exams					
WT 24/25	76-T-MACH-110272	<a href="#">System Integration in Micro- and Nanotechnology 2</a>			Gengenbach

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral exam, approx. 15 min.

**Prerequisites**

None

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****System Integration in Micro- and Nanotechnology 2**2105040, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

Introduction to system integration (novel processes and applications)

Assembly of hybrid microsystems

Packaging processes

Applications:

- Lab-on-chip systems
- Microoptical systems
- Silicon Photonics

Novel integration processes:

- Direct Laser Writing
- Self Assembly

**Learning objectives**

The students acquire knowledge of novel system integration technologies and their application in microoptic and microfluidic systems.

**Literature**

N.-T. Nguyen, Fundamentals and Applications of Microfluidics, Artech House

G. T. Reed, Silicon Photonics: An Introduction, Wiley



**T****3.344 Course: Systematic Materials Selection [T-MACH-100531]**





**Responsible:** Dr.-Ing. Stefan Dietrich  
Prof. Dr.-Ing. Volker Schulze

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	5

Events					
ST 2025	2174576	<a href="#">Systematic Materials Selection</a>	3 SWS	Lecture / 	Dietrich
ST 2025	2174577	<a href="#">Exercices in Systematic Materials Selection</a>	1 SWS	Practice / 	Dietrich
Exams					
WT 24/25	76-T-MACH-100531	<a href="#">Systematic Materials Selection</a>			Dietrich
ST 2025	76-T-MACH-100531	<a href="#">Systematic Materials Selection</a>			Dietrich

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

The assessment is carried out as a written exam of 2 h.

**Prerequisites**

none

**Recommendation**

Basic knowledge in materials science, mechanics and mechanical design due to the lecture Materials Science I/II.

**Workload**

120 hours

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

**V****Systematic Materials Selection**

2174576, SS 2025, 3 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

Important aspects and criteria of materials selection are examined and guidelines for a systematic approach to materials selection are developed. 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

**learning objectives:**

The students are able to select the best material for a given application. They are proficient in selecting materials on base of performance indices and materials selection charts. They can identify conflicting objectives and find sound compromises. They are aware of the potential and the limits of hybrid material concepts (composites, bimetals, foams) and can determine whether following such a concept yields a useful benefit.

**requirements:**

Wilng SPO 2007 (B.Sc.)

The course Material Science I [21760] has to be completed beforehand.

Wilng (M.Sc.)

The course Material Science I [21760] has to be completed beforehand.

**workload:**

The workload for the lecture is 120 h per semester and consists of the presence during the lecture (30 h) as well as preparation and rework time at home (30 h) and preparation time for the oral exam (60 h).

**Literature**



Vorlesungsskriptum; Übungsblätter; Lehrbuch: 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




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

**3.345 Course: Systems Engineering for Automotive Electronics [T-ETIT-100677]****Responsible:** Hon.-Prof. Dr. Jürgen Bortolazzi**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2311642	<a href="#">Systems Engineering for Automotive Electronics</a>	2 SWS	Lecture / 	Bortolazzi
ST 2025	2311644	<a href="#">Tutorial for 2311642 Systems Engineering for Automotive Electronics</a>	1 SWS	Practice / 	Beck

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Prerequisites**

none

**3.346 Course: Technical Design in Product Development [T-MACH-105361]**

**Responsible:** Prof. Dr.-Ing. Albert Albers  
Prof. Dr.-Ing. Sven Matthiesen  
Dr.-Ing. Markus Schmid

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	1

**Competence Certificate**

Written exam (60 min)

Only dictionary is allowed

**Workload**

120 hours





## T

**3.347 Course: Technical Energy Systems for Buildings 1: Processes & Components [T-MACH-105559]****Responsible:** Dr. Ferdinand Schmidt**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1**Events**

WT 24/25	2157200	<a href="#">Technical energy systems for buildings 1: Processes &amp; components</a>	2 SWS	Lecture / 	Schmidt
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**Exams**

WT 24/25	76-T-MACH-105559	<a href="#">Technical Energy Systems for Buildings 1: Processes &amp; Components</a>	Schmidt
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Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, approx. 30 minutes

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Technical energy systems for buildings 1: Processes & components**2157200, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

Introduction to heating and cooling technologies for buildings, solar energy utilization in buildings (solar radiation, solar thermal energy, photovoltaics) and to energy storage in buildings (thermal and electric storage technologies). Topics covered:

- Burners, condensing and non-condensing boilers
- Cogeneration units for use in buildings
- Heat transformation: Fundamentals, vapor compression, absorption, adsorption
- Solar energy: Radiation, solar thermal collectors, photovoltaics
- energy storage in buildings: thermal and electric storage

**Learning objectives:**

Students know relevant technical components of energy supply systems in buildings (heating and cooling, dehumidification). They know the energy conversion processes associated with these components and can estimate their energy efficiencies as well as the most important factors influencing efficiency.

Students are familiar with the underlying physics (mostly thermodynamics) of the relevant processes. They can derive relevant figures of merit from these principles. They know the degree of technological development for the various processes and components and are aware of current research and development objectives in this field.

Oral exam: about 25 min.

No tools



**3.348 Course: Technical Energy Systems for Buildings 2: System Concept [T-MACH-105560]****Responsible:** Dr. Ferdinand Schmidt**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2158201	<a href="#">Technical energy systems for buildings 2: System concepts</a>	2 SWS	Lecture /	Schmidt
Exams					
WT 24/25	76-T-MACH-105560	<a href="#">Technical Energy Systems for Buildings 2: System Concept</a>			Schmidt

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam, approx. 30 minutes

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***Technical energy systems for buildings 2: System concepts**2158201, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****Content**

Introduction of relevant figures of merit for technical energy systems in buildings. Description of different system concepts for energy supply of buildings (heating, cooling, dehumidification) and evaluation according to figures of merit. Systems covered include

- Heat pumps and heat pump systems including combination with solar thermal energy
- cogeneration and trigeneration system (heating, cooling, power)
- Solar thermal systems: Domestic hot water, heating support, cooling and dehumidification
- District heating systems including solar thermal heat
- Photovoltaics and heat pump systems including thermal and battery storage
- Grid-reactive building technology: Smart-Metering, Smart Home, Smart Grid

**Learning outcomes:**

Students are able to develop system concepts for technical energy systems in buildings and to rationally design such systems. They know the relevant figures of merit for an energy-related as well as an economical or combined evaluation of systems, and know how to employ these figures of merit in sizing systems and components. Students are able to employ plausibility checks and to give rough estimates on building energy concepts and they know which technologies can be combined for highly efficient system combinations.

Workload: 30 hours course attendance, 90 hours self-study

Oral exam apr. 25 minutes



### 3.349 Course: Technical Thermodynamics and Heat Transfer I [T-MACH-112912]

**Responsible:** Prof. Dr. Ulrich Maas

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each winter term	1 terms	2

Events					
WT 24/25	2165501	<a href="#">Technical Thermodynamics and Heat Transfer I</a>	4 SWS	Lecture /	Maas
Exams					
WT 24/25	76-T-MACH-112912	<a href="#">Technical Thermodynamics and Heat Transfer I</a>			Maas, Schießl
ST 2025	76-T-MACH-112912	<a href="#">Technical Thermodynamics and Heat Transfer I</a>			Maas, Schießl

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

Written exam; approx. 3hours

#### Prerequisites

Successful participation in the tutorial (T-MACH-112910 - Tutorial Technical Thermodynamics and Heat Transfer I)

#### Modeled Conditions

The following conditions have to be fulfilled:

1. The course [T-MACH-112910 - Tutorial Technical Thermodynamics and Heat Transfer I](#) must have been passed.

#### Annotation

It will be offered for the first time in the winter semester of 2024/2025.

#### Workload

180 hours

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



#### Technical Thermodynamics and Heat Transfer I

2165501, WS 24/25, 4 SWS, Language: German, [Open in study portal](#)

Lecture (V)  
On-Site

#### Content

- System, properties of state
- Absolute temperature, model systems
- 1st law of thermodynamics for resting and moving systems
- Entropy and 2nd law of thermodynamics
- Behavior of real substances described by tables, diagrams and equations of state
- Machine processes
- Mixtures of ideal and real compounds

#### Literature

Vorlesungsskriptum

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.

**3.350 Course: Technology of Steel Components [T-MACH-105362]**

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

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	2

Events					
ST 2025	2174579	<a href="#">Technology of steel components</a>	2 SWS	Lecture /	Schulze
Exams					
WT 24/25	76-T-MACH-105362	<a href="#">Technology of Steel Components</a>			Schulze
ST 2025	76-T-MACH-105362	<a href="#">Technology of Steel Components</a>			Schulze

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Oral exam, about 25 minutes

**Prerequisites**

none

**Workload**

120 hours

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

**Technology of steel components**

2174579, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
On-Site

**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

**learning objectives:**

The students have the background to evaluate the influence of manufacture processes on the compound state of metallic compounds. The students can assess the influence and the stability of compound state under mechanical load. The students are capable to describe the individual aspects of interaction of the compound state of steel components due to forming, heat treatment, mechanical surface treatment and joining processes.

**requirements:**

Materials Science and Engineering I & II

**workload:**

regular attendance: 21 hours  
 self-study: 99 hours

**Literature**

Skript wird in der Vorlesung ausgegeben

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



### 3.351 Course: Ten Lectures on Turbulence [T-MACH-105456]

**Responsible:** Dr. Ivan Otic

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2189904	<a href="#">Ten lectures on turbulence</a>	2 SWS	Lecture /	Otic
Exams					
WT 24/25	76-T-MACH-105456	<a href="#">Ten Lectures on Turbulence</a>			Otic

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

oral exam, 20 min

#### Prerequisites

none

#### Workload

120 hours

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



#### Ten lectures on turbulence

2189904, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**

#### Content

##### Contents:

The course is aimed at giving the fundamentals of turbulence theory, modelling and simulation. Governing equations and statistical description of turbulence are introduced. Reynolds equations, Kolmogorov's theory and scales of turbulent flows are discussed. Homogeneous and isotropic turbulence. Turbulent free-shear flows and wall-bounded turbulent flows are discussed. Turbulence modelling approaches and simulation methods are introduced.

- 1 Introduction
- 2 Turbulent transport of momentum and heat
- 3 Statistical description of turbulence
- 4 Scales of turbulent flows
- 5 Homogeneous turbulent shear flows
- 6 Free turbulent shear flows
- 7 Wall-Bounded turbulent flows
- 8 Turbulence Modelling
- 9 Reynolds Averaged Navier-Stokes (RANS) Simulation Approach
- 10 Large Eddy Simulation (LES) Approach

##### Objectives:

At the completion of this course, students

- are able to understand fundamentals of statistical fluid mechanics, turbulence theory and turbulence modelling
- are able to derive RANS and LES transport equations
- get working knowledge of modelling techniques that can be used for solving engineering heat and mass transfer problems.
- able to formulate an own turbulence model and implement it into the opensource computational fluid dynamics software OpenFOAM.

**Literature**

Reference texts:

- Lecture Notes
- Presentation slides



Recommended Books:





- Pope, S. B.: Turbulent Flows. Cambridge University Press, 2003.
- Hinze J. O.: Turbulence. McGraw-Hill, 1975.

## T

## 3.352 Course: Theory of Probability [T-ETIT-101952]

**Responsible:** Dr.-Ing. Holger Jäkel**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-MACH-104882 - Courses of the KIT Department of Electrical Engineering and Information Technology](#)**Type**  
Written examination**Credits**  
5**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2310505	<a href="#">Theory of Probability</a>	2 SWS	Lecture / 	Jäkel, Rost
WT 24/25	2310507	<a href="#">Tutorial for 2310505 Theory of Probability</a>	1 SWS	Practice / 	Jäkel
Exams					
WT 24/25	7310505	<a href="#">Theory of Probability</a>	Jäkel		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Prerequisites**

Contents of higher mathematics are necessary (e.g. M-MATH-101731 und M-MATH-101732).



### 3.353 Course: Theory of Stability [T-MACH-105372]

**Responsible:** Prof. Dr.-Ing. Alexander Fidlin

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each summer term	1

Events					
ST 2025	2163113	<a href="#">Theory of Stability</a>	2 SWS	Lecture /	Fidlin
ST 2025	2163114	<a href="#">Theory of Stability (Tutorial)</a>	2 SWS	Practice /	Fidlin

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

oral exam, 30 min.

#### Prerequisites

none

#### Recommendation

Vibration theory, Mathematical Methods of Vibration Theory

#### Workload

180 hours

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



#### Theory of Stability

2163113, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### 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





#### Literature

- Pannovko Y.G., Gubanov 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****3.354 Course: Thermal Turbomachines I [T-MACH-105363]****Responsible:** Prof. Dr.-Ing. Hans-Jörg Bauer**Organisation:** KIT Department of Mechanical Engineering  
Institute of Thermal Turbomachinery**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
3

Events					
WT 24/25	2169453	<a href="#">Thermal Turbomachines I</a>	3 SWS	Lecture / 	Bauer
WT 24/25	2169454	<a href="#">Tutorial - Thermal Turbo Machines I</a>	2 SWS	Practice / 	Bauer
Exams					
WT 24/25	76-T-MACH-105363	<a href="#">Thermal Turbomachines I</a>			Bauer
WT 24/25	76-T-MACH-105363-Wdh	<a href="#">Thermal Turbomachines I (for repeaters)</a>			Bauer
ST 2025	76-T-MACH-105363	<a href="#">Thermal Turbomachines I</a>			Bauer
ST 2025	76T-Mach-105363-Wdh	<a href="#">Thermal Turbomachines I (for repeater)</a>			Bauer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, duration 30 min.

**Prerequisites**

none

**Workload**

180 hours

*Below you will find excerpts from events related to this course:***V****Thermal Turbomachines I**2169453, WS 24/25, 3 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**On-Site**

**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

The students are able to explain and comment on the design and operation of thermal turbomachines in detail. Moreover, they can evaluate the range of applications for turbomachinery. Therefore, students are able to describe and analyse not only the individual components but also entire assemblies. The students can assess and evaluate the effects of physical, economical and ecological boundary conditions.

regular attendance: 31,50 h

self-study: 64,40 h

**Recommendations:**

Recommended in combination with the lecture 'Thermal Turbomachines II'.

Examination:

oral

Duration: approximately 30 min

no tools or reference materials may be used during the exam

**Organizational issues**

Vorlesung wird nur noch in Englisch gehalten ab WS 2023/24.

Aufzeichnungen in Deutsch aus früheren Vorlesungen werden weiter zur Verfügung gestellt.

**Literature**

Vorlesungsskript (erhältlich im 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

**3.355 Course: Thermal Turbomachines II [T-MACH-105364]****Responsible:** Prof. Dr.-Ing. Hans-Jörg Bauer**Organisation:** KIT Department of Mechanical Engineering  
Institute of Thermal Turbomachinery**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each summer term	2

Events					
ST 2025	2170477	<a href="#">Tutorial - Thermal Turbomachines II (Übung - Thermische Turbomaschinen II)</a>	2 SWS	Practice / 	Bauer, Mitarbeiter
ST 2025	2170553	<a href="#">Thermal Turbomachines II (in English)</a>	3 SWS	Lecture / 	Bauer
Exams					
WT 24/25	76-T-MACH-105364	<a href="#">Thermal Turbomachines II</a>			Bauer
WT 24/25	76-T-MACH-105364-Wdh	<a href="#">Thermal Turbomachines II (for repeaters)</a>			Bauer
ST 2025	76-T-MACH-105364	<a href="#">Thermal Turbomachines II</a>			Bauer
ST 2025	76T-Mach-105364-Wdh	<a href="#">Thermal Turbomachines II (for repeaters)</a>			Bauer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, duration: 30 min.

**Prerequisites**

none

**Workload**

180 hours

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

## V

**Thermal Turbomachines II (in English)**2170553, SS 2025, 3 SWS, Language: English, [Open in study portal](#)**Lecture (V)**  
**On-Site**

**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

**Recommendations:**

Recommended in combination with the lecture 'Thermal Turbomachines II'.

regular attendance: 31,50 h

self-study: 64,40 h

The students are able to explain and comment on the design and operation of thermal turbomachines in detail. Moreover, they can evaluate the range of applications for turbomachinery. Therefore, students are able to describe and analyse not only the individual components but also entire assemblies. The students can assess and evaluate the effects of physical, economical and ecological boundary conditions.

Exam:

oral

Duration: approximately 30 min

no tools or reference materials may be used during the exam.

**Literature**


Vorlesungsskript (erhältlich im 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****3.356 Course: Thermal-Fluid-Dynamics [T-MACH-106372]****Responsible:** Dr. Sebastian Ruck**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2189423	<a href="#">Thermal-Fluid-Dynamics</a>	2 SWS	Lecture / 	Ruck
Exams					
WT 24/25	76-T-MACH-106372	<a href="#">Thermal-Fluid-Dynamics</a>			Ruck
ST 2025	76-T-MACH-106372	<a href="#">Thermal-Fluid-Dynamics</a>			Ruck

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam of about 30 minutes

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Thermal-Fluid-Dynamics**2189423, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site**

**Content**  
**Content**

- Fundamentals of flows and heat transfer
- Dimensionless parameters of thermal fluid dynamics
- Velocity and temperature laws in boundary layers
- Convective heat transfer of external and internal flows
- Heat transfer analogies (Prandtl-, von Kármán, Martinelli,...)
- Methods for enhancing heat transfer
- Strategies and methods for investigation of thermal-hydraulics in R&D

The lecture provides an overview of momentum and energy transport as occurring in power engineering components and heat exchangers. On the basis of the conservation equations and the fundamentals of thermal-hydraulics, dimensionless parameters for forced and free convection are evolved. Flows close to walls play a crucial role for the convective heat transfer and for heat exchanger components. Thus, with scaling rules the laminar and turbulent thermal boundary layer equations are introduced. In the following, velocity and temperature laws of the wall as a basis for analogies and models of computational tools are discussed and the influence of roughness and surface design are shown. Concepts of state-of-the-art turbulence modelling and their applicability for different conditions or different heat transfer fluids (e.g. liquid metals, gas, oil) are described. Analogies and correlations for internal and external forced convection are developed by means of approximation concepts. Design options to enhance the efficiency and effectiveness of heat exchangers are discussed.

The objectives of the lecture are the fundamentals of thermal-hydraulics for describing and modelling convective fluid flow as occurring in power engineering components. A major objective is the description of the convective heat transfer for external and internal flows. A key issue is the transfer of analytic models and empirical results into "state of the art" computational tools and their validation by advanced experimental methods. Within the scope of the course, the students learn (a) to develop differential equation for thermal-hydraulic problems and to describe the thermal flow field by means of dimensionless parameters, (b) to transfer a real problem to an experiment or computational model, (c) to develop analogies and correlations for heat transfer processes of forced convection, (d) to select adequate computational methods/models, (e) to evaluate and select experiments including measurement techniques with adequate instrumentation for thermal-hydraulic problems and (f) to know design option for an efficient and effective heat exchange.

Attendance time: 21 h

Preparation/follow-up time of lectures, exam preparation: 90h

Oral exam of about 30 min.

**Literature**

Literaturlisten und Angabe von Fachliteratur werden jeweils in den Vorlesungen genannt. Unterlagen zur Lehrveranstaltung werden online unter <http://ilias.studium.kit.edu> zu Verfügung gestellt. Handout mit Übungsaufgaben für ausgewählte Themengebiete in den jeweiligen Vorlesungen.

## T

**3.357 Course: Thesis (BSc) [T-MACH-110107]**

**Responsible:** Prof. Dr.-Ing. Bettina Frohnäpfel  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** [M-MACH-104840 - Project](#)

Type	Credits	Grading scale	Recurrence	Version
Final Thesis	15	Grade to a third	Each term	1

**Competence Certificate**

The Thesis work consists of a written Thesis work and an presentation of a scientific subject chosen by the student himself/herself or given by the supervisor. The Thesis work 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.

**Prerequisites**

none

**Final Thesis**

This course represents a final thesis. The following periods have been supplied:

<b>Submission deadline</b>	3 months
<b>Maximum extension period</b>	1 months
<b>Correction period</b>	6 weeks

**Workload**

450 hours

## T

**3.358 Course: Thesis (MSc) [T-MACH-109880]**

**Responsible:** Prof. Dr.-Ing. Bettina Frohnapfel  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** [M-MACH-104840 - Project](#)

Type	Credits	Grading scale	Recurrence	Version
Final Thesis	30	Grade to a third	Each term	1

**Competence Certificate**

The Thesis (MSc) work consists of a written Thesis work and an presentation of a scientific subject chosen by the student himself/herself or given by the supervisor. The Thesis work 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.

**Prerequisites**

none

**Final Thesis**

This course represents a final thesis. The following periods have been supplied:

<b>Submission deadline</b>	6 months
<b>Maximum extension period</b>	1 months
<b>Correction period</b>	6 weeks

**Workload**

900 hours




**T****3.359 Course: Thin Film and Small-scale Mechanical Behavior [T-MACH-105554]**





**Responsible:** Dr. Patric Gruber  
 Prof. Dr. Christoph Kirchlechner  
 Dr. Daniel Weygand

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	2

Events					
ST 2025	2178420	<a href="#">Mechanical properties of nanomaterials and microsystems</a>	2 SWS	Lecture / 	Kirchlechner, Gruber, Weygand
Exams					
WT 24/25	76-T-MACH-105554	<a href="#">Thin Film and Small-scale Mechanical Behavior</a>			Kirchlechner, Gruber, Weygand
ST 2025	76-T-MACH-105554	<a href="#">Thin Film and Small-scale Mechanical Behavior</a>			Kirchlechner, Gruber, Weygand

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam 30 minutes

**Prerequisites**

Mutual exclusion with T-MACH-114018

**Recommendation**

preliminary knowledge in materials science, physics and mathematics

**Workload**

120 hours

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

**V****Mechanical properties of nanomaterials and microsystems**

2178420, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

**Content**

1. Introduction: Application and properties of micro- and nanosystems; Overview on size effects
2. Fundamentals: Dislocation plasticity (definition of a dislocation; dislocation density, mobility, dislocation sources, statistical aspects incl. SSDs and GNDs).
3. Single crystal plasticity: mechanical and microstructure characterization, mechanisms and their size dependence.
4. Interface plasticity: Compatibility, slip transfer mechanisms, expected size effects.
5. Modelling of mechanisms causing size effects in crystals and at grain boundaries, e.g. dislocation dynamics.
6. Thin film materials: synthesis, characterization and mechanical properties.
7. Nanocrystalline materials: Synthesis, outstanding mechanical properties
8. Elektro-mechanical conversion: piezo-resistive, piezo-elektric, elektrostatic, ...
9. Actuation: inverse piezoelectric effect, shape-memory, electromagnetic, ...

The students know and understand size and scaling effects in micro- and nanosystems based on the fundamental microstructure mechanisms at play. They can describe the mechanical behavior of nano- and microstructured materials and analyze and explain the origin for the differences compared to classical material behavior. They are able to explain suitable processing routes, experimental characterization techniques and adequate modelling schemes for nano- and microstructured materials. They also understand the relevance of mechanical phenomena in small dimensions and can judge how they determine material processing as well the performance and the design of microsensors and microactuators.

regular attendance: 22,5 hours

self-study: 97,5 hours

oral exam ca. 30 minutes





**Literature**

1. M. Ohring: „The Materials Science of Thin Films“, Academic Press, 1992
2. L.B. Freund and S. Suresh: „Thin Film Materials

## T

**3.360 Course: Tires and Wheel Development for Passenger Cars [T-MACH-102207]****Responsible:** Prof. Dr.-Ing. Günter Leister**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each summer term**Version**  
1

Events					
ST 2025	2114845	<a href="#">Tires and Wheel Development for Passenger Cars</a>	2 SWS	Lecture / 	Leister
Exams					
WT 24/25	76-T-MACH-102207	<a href="#">Tires and Wheel Development for Passenger Cars</a>			Leister

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral Examination

Duration: 30 up to 40 minutes

Auxiliary means: none

**Prerequisites**

none

**Workload**

120 hours

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

## V

**Tires and Wheel Development for Passenger Cars**2114845, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site****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 including Design and manufacturing methods, Wheeltesting
7. Tire pressure: Indirect and direct measuring systems
8. Tire testing subjective and objective

**Learning Objectives:**

The students are informed about the interactions of tires, wheels and chassis. They have an overview of the processes regarding the tire and wheel development. They have knowledge of the physical relationships.

**Organizational issues**

Voraussichtliche Termine, nähere Informationen und eventuelle Terminänderungen:

siehe Institutshomepage.

**Literature**

Manuskript zur Vorlesung

Manuskript to the lecture

**3.361 Course: Tractors [T-MACH-105423]**

**Responsible:** Prof. Dr.-Ing. Marcus Geimer  
Hon.-Prof. Dr. Martin Kremmer

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Written examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 24/25	2113080	<a href="#">Tractors</a>	2 SWS	/	Kremmer
Exams					
WT 24/25	76-T-MACH-105423	<a href="#">Tractors</a>	Geimer, Kremmer		
ST 2025	76-T-MACH-105423	<a href="#">Tractors</a>	Geimer		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

The assessment consists of an written exam taking place in the recess period (90 min).

**Prerequisites**

none

**Recommendation**

Basic knowledge in mechanical engineering.

**Annotation****Learning Outcomes**

After completion of the course the Students know:

- important problems in agritechnological developments
- Customer requirements and their implementation in tractors
- Tractor technology in width and depth

**Content**

Tractors are one of the most underestimated vehicles in regard to performance und technics. Almost none vehicle is as multifunctional and fulfilled with high-tech as a tractor. Automatic guidance, special chassis suspension or special concepts of power trains are one of the topics where tractors are in leading position in technologies. During the lecture an overview about the design and construction and application area is given. A close look will be taken on the historical background, legal requirements, ways of development, agricultural organizations and the process of development itself.

In detail the following topics will be dealt with:

- agricultural organization / legal requirements
- history of tractors
- tractor engineering
- tractor mechanics
- chassis suspension
- combustion engine
- transmission
- interfaces
- hydraulics
- wheels and tyres
- cabin
- electrics and electronics

**Literature**

- K.T. Renius: Traktoren - Technik und ihre Anwendung; DLG Verlag (Frankfurt), 1985
- E. Schilling: Landmaschinen - Lehr- und Handbuch für den Landmaschinenbau; Schilling-Verlag (Köln), 1960

**Workload**

120 hours

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

**Tractors**

2113080, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**On-Site**

**Content**

Tractors are one of the most underestimated vehicles in regard to performance und technics. Almost none vehicle is as multifunctional and fulfilled with high-tec as a tractor. Automatic guidance, special chassis suspension or special concepts of power trains are one of the topics where tractors are in leading position in technologies

During the lecture an overview about the design and construction and application area is given. A close look will be taken on the historical backround, legal requirements, ways of development, agricultural organizations and the proces of development itself.

In detail the following topics will be dealt with:

- agricultural organization / legal requirements
- history of tractors
- tractor engineering
- tractor mechanics
- chassis suspension
- combustion engine
- transmission
- interfaces
- hydraulics
- wheels and tyres
- cabin
- electrics and electronics

basic knowledge in mechanical engineering

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

**Organizational issues**

Ort/Zeit siehe Institutshomepage

**Literature**

- K.T. Renius: Traktoren - Technik und ihre Anwendung; DLG Verlag (Frankfurt), 1985
- E. Schilling: Landmaschinen - Lehr- und Handbuch für den Landmaschinenbau; Schilling-Verlag (Köln), 1960



### 3.362 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Oral examination

**Credits**  
8

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
2

Events					
WT 24/25	2181114	<a href="#">Tribology</a>	5 SWS	Lecture / Practice ( / ) 	Dienwiebel, Scherge
Exams					
WT 24/25	76-T-MACH-105531	<a href="#">Tribology</a>			Dienwiebel

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### 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 - Exercises - Tribology](#) must have been passed.

#### Recommendation

preliminary knowledge in mathematics, mechanics and materials science

#### Workload

240 hours

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



#### Tribology

2181114, WS 24/25, 5 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)**  
**On-Site**

## Content

- Chapter 1: Friction  
adhesion, geometrical and real area of contact, Friction experiments, friction powder, tribological stressing, environmental 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.

The student can

- describe the fundamental friction and wear mechanisms, which occur in tribologically stressed systems
- evaluate the friction and wear behavior of tribological systems
- explain the effects of lubricants and their most important additives
- identify suitable approaches to optimize tribological systems
- explain the most important experimental methods for the measurement of friction and wear, and is able to use them for the characterisation of tribo pairs
- choose suitable methods for the evaluation of roughness and topography from the nm-scale to the mm-scale and is able to interpret the determined values in respect to their effect on the tribological behavior
- describe the most important surface-analytical methods and their physical principles for the characterization of tribologically stressed sliding surfaces

preliminary knowledge in mathematics, mechanics and materials science recommended

regular attendance: 45 hours

self-study: 195 hours

oral examination (ca. 40 min)

no tools or reference materials

admission to the exam only with successful completion of the exercises

## 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

**3.363 Course: Tutorial Computational Continuum Mechanics [T-MACH-112996]****Responsible:** Prof. Dr.-Ing. Thomas Böhlke**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	1

Events					
ST 2025	2162262	<a href="#">Tutorial Computational Continuum Mechanics</a>	2 SWS	Practice / 	Hille, Lalović, Böhlke

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Successful solution of the homework sheets. Details are announced during the first lecture "Computational Continuum Mechanics".

**Prerequisites**

none

**Workload**

30 hours

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

## V

**Tutorial Computational Continuum Mechanics**2162262, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Practice (Ü)  
On-Site****Content**

See "Computational Continuum Mechanics"

**Literature**

Siehe "Rechnergestützte Kontinuumsmechanik"

## T


**3.364 Course: Tutorial Continuum Mechanics of Solids and Fluids [T-MACH-110333]**





**Responsible:** Prof. Dr.-Ing. Thomas Böhlke  
Prof. Dr.-Ing. Bettina Frohnäpfel

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each winter term	1

Events					
WT 24/25	2161253	<a href="#">Tutorial Continuum mechanics of solids and fluids</a>	2 SWS	Practice / 	Gisy, Speichinger, Böhlke
Exams					
WT 24/25	76-T-MACH-110333	<a href="#">Tutorial Continuum Mechanics of solids and fluids</a>	Böhlke, Frohnäpfel		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Successfully passing the Tutorial is a prerequisite for taking part in the exam "Continuum Mechanics of Solids and Fluids" (T-MACH-110377).

For students of Mechanical Engineering (BSc) that have chosen the Major Field "Continuum Mechanics" and for students of Material Science and Material Technology (BSc) the prerequisites consist of successfully solving the written homework sheets as well as the computational homework sheets during the associated computer tutorials.

For students of Mechanical Engineering that have chosen a different Major Field of students from different fields of study the prerequisites consist of successfully solving only the written homework sheets.

**Prerequisites**

None

**Annotation**

Due to capacity reasons it is possible that not all students of this course can be admitted to the computer tutorials. Students of the bachelor's degree program in mechanical engineering who have chosen the Major Field Continuum Mechanics (SP-Nr 13) and students of the bachelor's degree program in material science and material technology will be admitted to the computer tutorials in any case.

If additional places are available in the computer tutorials for this course, these will be allocated according to the BSc average grade.

**Workload**

30 hours

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

## V

**Tutorial Continuum mechanics of solids and fluids**

2161253, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)  
On-Site**

**Content**

Please refer to the lecture "Continuum mechanics of solids and fluids".

**Literature**

Siehe Vorlesung "Kontinuumsmechanik der Festkörper und Fluide".

Please refer to the lecture "Continuum mechanics of solids and fluids".

## T

**3.365 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-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (written)	0	pass/fail	Each summer term	3

Events					
ST 2025	2162251	<a href="#">Tutorial Engineering Mechanics II</a>	2 SWS	Practice /	Klein, Lauff, Böhlke
ST 2025	3162011	<a href="#">Engineering Mechanics II (Tutorial)</a>	2 SWS	Practice /	Gisy, Lalović, Langhoff

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Successful solution of worksheets. Details are given in the first lecture "Engineering Mechanics II"

Passing this course allows to register 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 2025, 2 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)  
On-Site**

**Content**

see lecture Engineering Mechanics II

**Literature**

Siehe Vorlesung Technische Mechanik II

## V

**Engineering Mechanics II (Tutorial)**

3162011, SS 2025, 2 SWS, Language: English, [Open in study portal](#)

**Practice (Ü)  
On-Site**

**Content**

see lecture "Engineering Mechanics II"

**Literature**

see lecture "Engineering Mechanics II"

## T

**3.366 Course: Tutorial Engineering Mechanics III [T-MACH-112909]**

**Responsible:** N.N.  
Prof. Dr.-Ing. Carsten Proppe

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each winter term	1 terms	1

Exams			
WT 24/25	76-T-MACH-112909	<a href="#">Tutorial Engineering Mechanics III</a>	Proppe

**Competence Certificate**

Passing this course allows to register to the exam "Engineering Mechanics III" (see T-MACH-112906).

**Prerequisites**

none

**Workload**

30 hours

**T****3.367 Course: Tutorial Introduction to the Finite Element Method [T-MACH-110330]**





**Responsible:** Prof. Dr.-Ing. Thomas Böhlke  
Dr.-Ing. Tom-Alexander Langhoff

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each summer term	1

Events					
ST 2025	2162257	<a href="#">Tutorial Introduction to the Finite Element Method</a>	1 SWS	Practice / 	Lauff, Klein, Langhoff, Böhlke

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

Successful participation in this course allows for registration to the Exam "Introduction to the Finite Element Method" (see 76-T-MACH-105320)

For students of Mechanical Engineering (BSc) that have chosen the Major Field "Continuum Mechanics" the prerequisites consist of successfully solving the written homework sheets as well as the computational homework sheets during the associated computer tutorials.

For students of Mechanical Engineering that have chosen a different Major Field and for students from different fields of study the prerequisites consist of successfully solving only the written homework sheets.

**Annotation**

Knowledge of the contents of the courses "Continuum Mechanics of Solids and Fluids" and "Mathematical Methods of Continuum Mechanics" as well as the corresponding tutorials are expected.

Due to capacity reasons it is possible that not all students of this course can be admitted to the computer tutorials. Students of the bachelor's degree program in mechanical engineering who have chosen the Major Field Continuum Mechanics (SP-Nr 13) will be admitted to the computer tutorials in any case.

If additional places are available in the computer tutorials for this course, these will be allocated according to the BSc average grade.

**Workload**

30 hours

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

**V****Tutorial Introduction to the Finite Element Method**

2162257, SS 2025, 1 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)  
On-Site**

**Content**

See lecture "Introduction to the Finite Element Method"

**Literature**

siehe Vorlesung "Einführung in die Finite-Elemente-Methode"

**T****3.368 Course: Tutorial Mathematical Methods in Micromechanics [T-MACH-110379]**

**Responsible:** Prof. Dr.-Ing. Thomas Böhlke  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each summer term	1

**Competence Certificate**

Successfully solving the homework sheets. Details are given in the first lecture.

**Workload**

30 hours

**T****3.369 Course: Tutorial Nonlinear Continuum Mechanics [T-MACH-111027]****Responsible:** Prof. Dr.-Ing. Thomas Böhlke**Organisation:****Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each summer term	1 terms	2

Exams			
WT 24/25	76-T-MACH-111027	<a href="#">Tutorial Nonlinear Continuum Mechanics</a>	Böhlke

**Competence Certificate**

Written homework problems

Successful participation in this course allows for registration to the Exam "Nonlinear Continuum Mechanics" (see 76-T-MACH-111026)

**Prerequisites**




none





**Workload**

60 hours

## T

**3.370 Course: Tutorial Technical Thermodynamics and Heat Transfer I [T-MACH-112910]****Responsible:** Prof. Dr. Ulrich Maas**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Completed coursework (written)**Credits**  
1**Grading scale**  
pass/fail**Recurrence**  
Each winter term**Expansion**  
1 terms**Version**  
1

Events					
WT 24/25	2165502	<a href="#">Exercise course Technical Thermodynamics and Heat Transfer I</a>	2 SWS	Practice / 	Maas
WT 24/25	2165503	<a href="#">Tutorial Technical Thermodynamics and Heat Transfer I</a>	2 SWS	Tutorial ( / 	Maas
ST 2025	2166503	<a href="#">Technical Thermodynamics and Heat Transfer I (Repeater)</a>	2 SWS	Tutorial ( / 	Maas
Exams					
WT 24/25	76-T-MACH-112910	<a href="#">Tutorial Technical Thermodynamics and Heat Transfer I</a>	Maas, Schießl		
ST 2025	76-T-MACH-112910	<a href="#">Tutorial Technical Thermodynamics and Heat Transfer I</a>	Maas, Schießl		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Successful completion of written preliminary tests.

**Annotation**

It will be offered for the first time in the winter semester of 2024/2025.

**Workload**

30 hours

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

## V

**Technical Thermodynamics and Heat Transfer I (Repeater)**2166503, SS 2025, 2 SWS, Language: German, [Open in study portal](#)**Tutorial (Tu)  
On-Site****Literature**

Vorlesungsskriptum

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.





### 3.371 Course: Vacuum and Tritium Technology in Nuclear Fusion [T-MACH-108784]

**Responsible:** Dr.-Ing. Thomas Giegerich  
Dr. Robin Größle

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2025	2190499	<a href="#">Vacuum and Tritium Technology in Nuclear Fusion</a>	2 SWS	/	Größle, Giegerich
Exams					
ST 2025	76-T-MACH-108784	<a href="#">Vacuum and Tritium Technology in Nuclear Fusion</a>			Giegerich, Größle

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

oral examination, approx. 20 Minutes, any time in the year

#### Prerequisites

none

#### Recommendation

Knowledge in 'Fusion Technology A'

#### Workload

120 hours

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



### Vacuum and Tritium Technology in Nuclear Fusion

2190499, SS 2025, 2 SWS, Language: German/English, [Open in study portal](#)

**On-Site**

#### Content

Introduction

Tritium Handling

Tritium Plant Technologies

Tritium and Breeding

Fundamentals of Vacuum Science and Technology

Fusion Vacuum systems

Matter Injection into the Plasma Chamber

Fuel Cycle of ITER and DEMO

The students have acquired the necessary understanding in order to design and size facilities for tritium operation. They understand the process steps in the tritium plant of a fusion reactor for tritium removal and tritium recovery from tritiated exhaust gas. Furthermore, the students have understood the fundamentals of vacuum physics and are able to design and choose vacuum pumps properly.

recommended is Knowledge in "Fusion Technology A"

oral exam of about 20 min

#### Organizational issues

Anmeldung bis 20. April via E-Mail an: [thomas.giegerich@kit.edu](mailto:thomas.giegerich@kit.edu)

Voraussichtlich 4 Tage in der Pfingstwoche, jeweils 08:00-17:00 Uhr am CN. Raum wird bekanntgegeben.

**3.372 Course: Vehicle Lightweight Design - Strategies, Concepts, Materials [T-MACH-105237]**

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

Lightweight Design

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each winter term	2

Events					
WT 24/25	2113102	<a href="#">Vehicle Lightweight design – Strategies, Concepts, Materials</a>	2 SWS	Lecture /	Henning
Exams					
WT 24/25	76-T-MACH-105237	<a href="#">Vehicle Lightweight Design - Strategies, Concepts, Materials</a>			Henning

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Written exam; Duration approx. 90 min

**Prerequisites**

none

**Recommendation**

none

**Workload**

120 hours

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

**Vehicle Lightweight design – Strategies, Concepts, Materials**

2113102, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**Blended (On-Site/Online)**

**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

Steel, aluminium, magnesium, titan

**Aim of this lecture:**

Students learn that lightweight design is a process of realizing a demanded function by using the smallest possible mass. They understand lightweight construction as a complex optimization problem with multiple boundary conditions, involving competences from methods, materials and production.



Students learn the established lightweight strategies and ways of construction. They know the metallic materials used in lightweight construction and understand the relation between material and vehicle body.





**Literature**

- [1] E. Moeller, *Handbuch Konstruktionswerkstoffe : Auswahl, Eigenschaften, Anwendung*. München: Hanser, 2008.
- [2] H.-J. Bargel, *et al.*, *Werkstoffkunde*, 10., bearb. Aufl. ed. Berlin: Springer, 2008.
- [3] C. Kammer, *Aluminium-Taschenbuch : Grundlagen und Werkstoffe*, 16. Aufl. ed. Düsseldorf: Aluminium-Verl., 2002.
- [4] K. U. Kainer, "Magnesium - Eigenschaften, Anwendungen, Potentiale ", Weinheim [u.a.], 2000, pp. VIII, 320 S.
- [5] A. Beck and H. Altwicker, *Magnesium und seine Legierungen*, 2. Aufl., Nachdr. d. Ausg. 1939 ed. Berlin: Springer, 2001.
- [6] M. Peters, *Titan und Titanlegierungen*, [3., völlig neu bearb. Aufl.] ed. Weinheim [u.a.]: Wiley-VCH, 2002.
- [7] H. Domininghaus and P. Elsner, *Kunststoffe : Eigenschaften und Anwendungen; 240 Tab*, 7., neu bearb. u. erw. Aufl. ed. Berlin: Springer, 2008.

## T

**3.373 Course: Vehicle Systems for Urban Mobility [T-MACH-113069]****Responsible:** Prof. Dr.-Ing. Martin Cichon**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Version**  
3

Events					
WT 24/25	2115922	<a href="#">Vehicle Systems for Urban Mobility</a>	2 SWS	Lecture / 	Cichon, Ziesel
ST 2025	2115922	<a href="#">Vehicle Systems for Urban Mobility</a>	2 SWS	Lecture / 	Ziesel, Cichon
Exams					
WT 24/25	76-T-MACH-106428	<a href="#">Vehicle Systems for Urban Mobility</a>			Ziesel, Cichon
ST 2025	76-T-MACH-106428	<a href="#">Vehicle Systems for Urban Mobility</a>			Ziesel, Cichon

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Oral examination

Duration: approx. 20 minutes

No tools or reference material may be used during the exam.

**Workload**

120 hours

**3.374 Course: Vibration Theory [T-MACH-105290]**

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

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	4

Events					
WT 24/25	2161212	<a href="#">Vibration Theory</a>	2 SWS	Lecture /	Genda
WT 24/25	2161213	<a href="#">Übungen zu Technische Schwingungslehre</a>	2 SWS	Practice	Genda, Riedel
Exams					
WT 24/25	76-T-MACH-105290	<a href="#">Vibration Theory</a>			Fidlin

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

written exam, 180 min.

**Prerequisites**

Engineering Mechanics III comparable basic knowledge of dynamics

**Workload**

120 hours

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

**Vibration Theory**

2161212, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
On-Site

**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.

**Literature**

Klotter: Technische Schwingungslehre, Bd. 1 Teil A, Heidelberg, 1978

Hagedorn, Otterbein: Technische Schwingungslehre, Bd. 1 und Bd. 2, Berlin, 1987

Wittenburg: Schwingungslehre, Springer-Verlag, Berlin, 1995

**Übungen zu Technische Schwingungslehre**

2161213, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)**

**Content**

Exercises related to the lecture

**T****3.375 Course: Virtual Engineering (Specific Topics) [T-MACH-105381]****Responsible:** Prof. Dr.-Ing. Jivka Ovtcharova**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

**Competence Certificate**

oral exam, approx. 20 min.

**Prerequisites**

none

**Workload**

120 hours

**3.376 Course: Virtual Engineering I [T-MACH-102123]**

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

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

**Type**  
Written examination

**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
3

Events					
WT 24/25	2121352	<a href="#">Virtual Engineering I</a>	2 SWS	Lecture /	Ovtcharova, weitere Mitarbeitende
WT 24/25	2121353	<a href="#">Exercises Virtual Engineering I</a>	2 SWS	Practice /	Ovtcharova, Mitarbeiter, Mitarbeiter/innen
Exams					
WT 24/25	76-T-MACH-102123	<a href="#">Virtual Engineering I</a>	Ovtcharova, Meyer, Rönnau		

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

Written examination 90 min.

**Prerequisites**

None

**Workload**

120 hours

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

**Virtual Engineering I**

2121352, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)

**Lecture (V)**  
On-Site

**Content**

The course includes:

- Conception of the product (system approaches, requirements, definitions, structure)
- Generation of domain-specific product data (CAD, ECAD, software, ...) and AI methods
- Validation of product properties and production processes through simulation
- Digital twin for optimization of products and processes using AI methods

After successful attendance of the course, students can:

- conceptualize complex systems with the methods of virtual engineering and continue the product development in different domains
- model the digital product with regard to planning, design, manufacturing, assembly and maintenance.
- use validation systems to validate product and production in an exemplary manner.
- Describe AI methods along the product creation process.

**Literature**

Vorlesungsfolien / Lecture slides

**Exercises Virtual Engineering I**

2121353, WS 24/25, 2 SWS, Language: English, [Open in study portal](#)

**Practice (Ü)**  
On-Site

**Content**

The theoretical Konzepts and contents of the lecture will be trained within practical relevance by basic functionalities of VE System solutions.



**Organizational issues**

Practice dates will probably be offered on different afternoons (14:00 - 17:15) in two-week intervals at IMI / Übungstermine werden voraussichtlich an unterschiedlichen Nachmittagen (14:00 - 17:15) in zweiwöchigem Rhythmus am IMI angeboten.

**Literature**

Exercise script / Übungsskript

**T****3.377 Course: Virtual Engineering II [T-MACH-102124]****Responsible:** Prof. Dr.-Ing. Jivka Ovtcharova**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	3

Exams				
WT 24/25	76-T-MACH-102124	<a href="#">Virtual Engineering II</a>	Ovtcharova, Häfner	

**Competence Certificate**

Written examination 90 min.


**Prerequisites**





None

**Workload**

120 hours

**T****3.378 Course: Virtual Reality Practical Course [T-MACH-102149]****Responsible:** Prof. Dr.-Ing. Jivka Ovtcharova**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Examination of another type**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
WT 24/25	2123375	<a href="#">Virtual Reality Practical Course</a>	3 SWS	Project (P /  )	Ovtcharova, Häfner
Exams					
WT 24/25	76-T-MACH-102149	<a href="#">Virtual Reality Practical Course</a>			Ovtcharova, Häfner

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Assessment of another type (graded)

**Prerequisites**

None

**Annotation**

Number of participants is limited

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Virtual Reality Practical Course**2123375, WS 24/25, 3 SWS, Language: German/English, [Open in study portal](#)**Project (PRO)**  
**On-Site****Content**

- Introduction in Virtual Reality (hardware, software, applications)
- Exercises in the task specific software systems
- Autonomous project work in the area of Virtual Reality in small groups

**Literature**

Keine / None



### 3.379 Course: Warehousing and Distribution Systems [T-MACH-105174]

**Responsible:** Prof. Dr.-Ing. Kai Furmans

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	3

Events					
ST 2025	2118097	<a href="#">Warehousing and distribution systems</a>	2 SWS	Lecture /	Furmans

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

#### Competence Certificate

The success control takes place in form of a written examination (60 min) during the semester break (according to §4(2), 1 SPO). If the number of participants is low, an oral examination (according to §4 (2), 2 SPO) may also be offered.

#### Prerequisites

none

#### Workload

120 hours

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



#### Warehousing and distribution systems

2118097, SS 2025, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)**  
**On-Site**

#### Organizational issues

Die Vorlesung wird in diesem Semester als **Blockveranstaltung** angeboten. Die Veranstaltungstermine sind:

- Mi., 24. April
- Do., 25. April
- Fr., 26. April

Die Vorlesung startet jeweils um 08:00 Uhr und findet im **Selmayr-HS (Geb. 50.38)** statt. Bitte beachten Sie für mögliche kurzfristige Raumänderungen die Informationen im ILIAS-Kurs.

#### 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





Eine ausführliche Übersicht wissenschaftlicher Paper findet sich bei:

**ROODBERGEN, Kees Jan (2007)**

Warehouse Literature

**T****3.380 Course: Water Distribution Systems [T-BGU-108486]****Responsible:** Dr.-Ing. Peter Oberle**Organisation:** KIT Department of Civil Engineering, Geo and Environmental Sciences**Part of:** [M-MACH-105405 - Courses of the KIT Department of Civil Engineering, Geo and Environmental Sciences](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
2

Events					
WT 24/25	6222905	<a href="#">Water Distribution Systems</a>	4 SWS	Lecture / Practice ( /  )	Oberle
Exams					
WT 24/25	8244108486	<a href="#">Water Distribution Systems</a>	Oberle		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

The accomplishment 'Project Report Water Distribution Systems' (T-BGU-108485) has to be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-108485 - Project Report Water Distribution Systems](#) must have been passed.

**Recommendation**

none


**Annotation**





none

**Workload**

120 hours

**T****3.381 Course: Welding Technology [T-MACH-105170]****Responsible:** Dr.-Ing. Majid Farajian**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
1

Events					
WT 24/25	2173571	<a href="#">Welding Technology</a>	2 SWS	Block / 	Farajian
Exams					
WT 24/25	76-T-MACH-105170	<a href="#">Welding Technology</a>			Farajian

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**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.

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Welding Technology**2173571, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Block (B)**  
**On-Site**

**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

**learning objectives:**

The students have knowledge and understanding of the most important welding processes and its industrial application.

They are able to recognize, understand and handle problems occurring during the application of different welding processes relating to design, material and production.

They know the classification and the importance of welding technology within the scope of connecting processes (advantages/disadvantages, alternatives).

The students will understand the influence of weld quality on the performance and behavior of welded joints under static and cyclic load.

How the fatigue life of welded joints could be increased, will be part of the course.

**requirements:**

basics of material science ( iron- and non-iron alloys), of electrical engineering, of production processes.

**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).

**exam:**

oral, ca. 20 minutes, no auxiliary material

**Organizational issues**

Die Blockveranstaltung findet am 23.01.25, 24.01.2025, 30.01.2025, 31.10.2025 jeweils von 09:00 bis 15:00 Uhr in Gebäude 10.91 Raum 380 statt. Anmeldungen erfolgen über den Beitritt zum ILIAS-Kurs. Bei Fragen wenden Sie sich gerne an majid.farajian@kit.edu

**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

3.382 Course: Wildcard [T-MACH-112697]

**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** [M-MACH-106251 - Courses of the KIT Department of Architecture](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	15	pass/fail	Each term	1



**T****3.383 Course: Wildcard [T-MACH-112696]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106251 - Courses of the KIT Department of Architecture](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	15	Grade to a third	Each term	1

T

**3.384 Course: Wildcard [T-MACH-112698]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106252 - Courses of the KIT Department of Chemistry and Biosciences](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	15	Grade to a third	Each term	1

T

**3.385 Course: Wildcard [T-MACH-112703]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106254 - Courses of the KIT Department of Physics](#)**Type**  
Completed coursework**Credits**  
15**Grading scale**  
pass/fail**Recurrence**  
Each term**Version**  
1

**T****3.386 Course: Wildcard [T-MACH-112702]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106254 - Courses of the KIT Department of Physics](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	15	Grade to a third	Each term	1

T

**3.387 Course: Wildcard [T-MACH-112700]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106253 - Courses of the KIT Department of Humanities and Social Sciences](#)


Type	Credits	Grading scale	Recurrence	Version
Examination of another type	15	Grade to a third	Each term	1





**T****3.388 Course: Wildcard [T-MACH-112701]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106253 - Courses of the KIT Department of Humanities and Social Sciences](#)**Type**  
Completed coursework**Credits**  
15**Grading scale**  
pass/fail**Recurrence**  
Each term**Version**  
1

T

**3.389 Course: Wildcard [T-MACH-112699]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106252 - Courses of the KIT Department of Chemistry and Biosciences](#)**Type**  
Completed coursework**Credits**  
15**Grading scale**  
pass/fail**Recurrence**  
Each term**Version**  
1

**T****3.390 Course: Windpower [T-MACH-105234]****Responsible:** Norbert Lewald**Organisation:** KIT Department of Mechanical Engineering  
Institute of Thermal Turbomachinery**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Written examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
2

Events					
WT 24/25	2157381	<a href="#">Windpower</a>	2 SWS	Lecture / 	Lewald
Exams					
WT 24/25	76-T-MACH-105234	<a href="#">Windpower</a>			Lewald
ST 2025	76-T-MACH-105234	<a href="#">Windpower</a>			Lewald

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam, 120 minutes

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Windpower**2157381, WS 24/25, 2 SWS, Language: German, [Open in study portal](#)**Lecture (V)**  
**On-Site**



**T****3.391 Course: Working Methods in Materials Science and Technology [T-MACH-100288]****Responsible:** Prof. Dr.-Ing. Martin Heilmaier**Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (practical)	2	pass/fail	Each term	1

## T

**3.392 Course: Workshop Mechatronical Systems and Products [T-MACH-108680]**

**Responsible:** Prof. Dr.-Ing. Sören Hohmann  
Prof. Dr.-Ing. Sven Matthiesen

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	4	Grade to a third	Each winter term	5

Events					
WT 24/25	2145162	<a href="#">Workshop Mechatronical Systems and Products</a>	2 SWS	Practical course / ●	Matthiesen, Hohmann, Teltschik
Exams					
WT 24/25	76-T-MACH-108680	<a href="#">Workshop Mechatronical Systems and Products</a>			Hohmann, Matthiesen

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

### Competence Certificate

Alongside the workshop, deliverables will be requested at defined milestones. In these, the application of the knowledge that has been developed within the framework of the module will be examined. These deliverables consist of CAD designs, control software and reflection reports, for example, are defined in a workshop assignment at the beginning of the semester. The milestones are announced in a calendar at the beginning of the semester and are available to students through ILIAS. The demanded deliveries are uploaded to ILIAS.

### Prerequisites

none



### Annotation





All relevant content (scripts, exercise sheets, etc.) for the course can be obtained via the eLearning platform ILIAS. To participate in the course, please complete the survey "*Anmeldung und Gruppeneinteilung*" in ILIAS before the start of the semester.

### Workload

120 hours

**T****3.393 Course: Workshop on Computer-based Flow Measurement Techniques [T-MACH-106707]****Responsible:** Prof. Dr.-Ing. Hans-Jörg Bauer**Organisation:** KIT Department of Mechanical Engineering  
Institute of Thermal Turbomachinery**Part of:** [M-MACH-106250 - Courses of the KIT Department of Mechanical Engineering](#)**Type**  
Completed coursework**Credits**  
4**Grading scale**  
pass/fail**Recurrence**  
Each term**Version**  
1

Events					
WT 24/25	2171488	<a href="#">Workshop on computer-based flow measurement techniques</a>	3 SWS	Practical course / 	Bauer, Mitarbeiter
ST 2025	2171488	<a href="#">Workshop on computer-based flow measurement techniques</a>	3 SWS	Practical course / 	Bauer, Mitarbeiter
Exams					
WT 24/25	76-T-MACH-106707	<a href="#">Workshop on computer-based flow measurement techniques</a>	Bauer		

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Group colloquia for each topic

Duration: approximately 10 minutes

no tools or reference materials may be used

**Prerequisites**

none

**Workload**

120 hours

*Below you will find excerpts from events related to this course:***V****Workshop on computer-based flow measurement techniques**2171488, WS 24/25, 3 SWS, Language: German, [Open in study portal](#)**Practical course (P)**  
**On-Site**

### Content

Registration during the lecture period via the website.

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
- 

regular attendance: 52,5

self-study: 67,5

The students are able to:

- theoretically describe and explain the fundamentals of computer aided measurements and adopt them practically
- apply the basics learned during the lecture to a practical problem in the form of a PC exercise

Group colloquia for each topic

Duration: approximately 10 minutes

no tools or reference materials may be used

### Organizational issues

Der aktuelle Status wird auf der ITS-homepage bekannt gegeben.

### Literature

Germer, H.; Wefers, N.: Meßelektronik, Bd. 1, 1985

LabView User Manual

Hoffmann, Jörg: Taschenbuch der Messtechnik, 6., aktualisierte. Aufl. , 2011



### Workshop on computer-based flow measurement techniques

2171488, SS 2025, 3 SWS, Language: German, [Open in study portal](#)

**Practical course (P)**  
**On-Site**

**Content**

Registration during the lecture period via the website.

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

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regular attendance: 52,5

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The students are able to:

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- apply the basics learned during the lecture to a practical problem in the form of a PC exercise

Group colloquia for each topic

Duration: approximately 10 minutes

no tools or reference materials may be used

**Organizational issues**

Der aktuelle Status wird auf der ITS-homepage bekannt gegeben.

**Literature**

Germer, H.; Wefers, N.: Meßelektronik, Bd. 1, 1985

LabView User Manual

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