# Table of Contents

## Modules

1. **Orientation Exam**
   - Orientation Exam - M-MACH-104162

2. **Bachelor Thesis**
   - Bachelor Thesis - M-MACH-103722

3. **Fundamentals of Engineering**
   - Advanced Mathematics - M-MATH-104022
   - Engineering Mechanics (BSc-Modul 03, TM) - M-MACH-102572
   - Manufacturing Processes (MEI) - M-MACH-104232
   - Materials Science (BSc-Modul 04, WK) - M-MACH-102562
   - Technical Thermodynamics (BSc-Modul 05, TTD) - M-MACH-102574
   - Fluid Mechanics (BSc-Modul 12, SL) - M-MACH-102565
   - Physics - M-PHYS-104030
   - Electrical Engineering - M-ETIT-104049
   - Measurement and Control Systems (BSc-Modul 11, MRT) - M-MACH-102564
   - Computer Science (BSc-Modul 09, Inf) - M-MACH-102563
   - Mechanical Design (BSc-Modul 06, MKL) - M-MACH-102573
   - Machines and Processes (mach13BSc-Modul 13, MuP) - M-MACH-102566
   - Production Operations Management - M-MACH-100297

4. **Majors in Mechanical Engineering (International)**
   - MF A: Global Production Management - M-MACH-103351
   - MF B: Energy Engineering - M-MACH-103350
   - MF C: Automotive Engineering - M-MACH-103349

5. **International Project Management and Soft Skills**
   - International Project Management and Soft Skills - M-MACH-103322

## Courses

- Advanced Mathematics I - T-MATH-108266
- Advanced Mathematics I Prerequisite - T-MATH-108265
- Advanced Mathematics II - T-MATH-108268
- Advanced Mathematics II Prerequisite - T-MATH-108267
- Advanced Mathematics III - T-MATH-108270
- Advanced Mathematics III Prerequisite - T-MATH-108269
- Automated Production Systems (MEI) - T-MACH-106732
- Automotive Engineering I - T-MACH-100092
- Automotive Engineering II - T-MACH-102117
- Bachelor Thesis - T-MACH-108685
- Basics in Measurement and Control Systems - T-MACH-104745
- Basics of Manufacturing Technology (MEI) - T-MACH-108747
- Computer Science for Engineers - T-MACH-105205
- Computer Science for Engineers - T-MACH-105206
- Electrical Engineering and Electronics - T-ETIT-108386
- Electrical Machines - T-ETIT-100807
- Engineering Mechanics I - T-MACH-100282
- Engineering Mechanics II - T-MACH-100283
- Engineering Mechanics III & IV - T-MACH-105201
- Excercises in Technical Thermodynamics and Heat Transfer I - T-MACH-105204
- Excercises in Technical Thermodynamics and Heat Transfer II - T-MACH-105288
- Fluid Mechanics - T-MACH-105207
- Fundamentals of Combustion I - T-MACH-105213
<table>
<thead>
<tr>
<th>Course Title</th>
<th>Module Code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamentals of Energy Technology</td>
<td>T-MACH-105220</td>
<td>56</td>
</tr>
<tr>
<td>Global Logistics</td>
<td>T-MACH-105379</td>
<td>57</td>
</tr>
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<td>Global Production Engineering (MEI)</td>
<td>T-MACH-106731</td>
<td>58</td>
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<tr>
<td>Heat and Mass Transfer</td>
<td>T-MACH-105292</td>
<td>59</td>
</tr>
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<td>Machine Dynamics</td>
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<td>Machines and Processes</td>
<td>T-MACH-105208</td>
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<td>Machines and Processes, Prerequisite</td>
<td>T-MACH-105232</td>
<td>62</td>
</tr>
<tr>
<td>Materials Science I &amp; II</td>
<td>T-MACH-105145</td>
<td>63</td>
</tr>
<tr>
<td>Materials Science Lab Course</td>
<td>T-MACH-105146</td>
<td>64</td>
</tr>
<tr>
<td>Mechanical Design I &amp; II</td>
<td>T-MACH-105286</td>
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<tr>
<td>Mechanical Design II, prerequisites</td>
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<td>Mechanical Design III &amp; IV</td>
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<tr>
<td>Mechanical Design III, Constructing the Team</td>
<td>T-MACH-105284</td>
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<tr>
<td>Mechanical Design IV, Constructing the Team</td>
<td>T-MACH-105285</td>
<td>70</td>
</tr>
<tr>
<td>Presentation</td>
<td>T-MACH-108684</td>
<td>71</td>
</tr>
<tr>
<td>Production Operations Management</td>
<td>T-MACH-100304</td>
<td>72</td>
</tr>
<tr>
<td>Project and Operations Management</td>
<td>T-WIWI-108295</td>
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</tr>
<tr>
<td>SmartFactory@Industry (MEI)</td>
<td>T-MACH-106733</td>
<td>74</td>
</tr>
<tr>
<td>Technical Thermodynamics and Heat Transfer I</td>
<td>T-MACH-104747</td>
<td>75</td>
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<td>T-MACH-105287</td>
<td>76</td>
</tr>
<tr>
<td>Tutorial Engineering Mechanics I</td>
<td>T-MACH-100528</td>
<td>77</td>
</tr>
<tr>
<td>Tutorial Engineering Mechanics II</td>
<td>T-MACH-100284</td>
<td>78</td>
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<tr>
<td>Tutorial Engineering Mechanics III</td>
<td>T-MACH-105202</td>
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<tr>
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<td>T-MACH-105203</td>
<td>80</td>
</tr>
<tr>
<td>Vehicle Comfort and Acoustics I</td>
<td>T-MACH-105154</td>
<td>81</td>
</tr>
<tr>
<td>Vehicle Comfort and Acoustics II</td>
<td>T-MACH-105155</td>
<td>82</td>
</tr>
<tr>
<td>Virtual Engineering (Specific Topics)</td>
<td>T-MACH-105381</td>
<td>83</td>
</tr>
<tr>
<td>Wave and Quantum Physics</td>
<td>T-PHYS-108322</td>
<td>84</td>
</tr>
<tr>
<td>Working Methods in Mechanical Engineering</td>
<td>T-MACH-105296</td>
<td>85</td>
</tr>
</tbody>
</table>
Part I
Modules

1 Orientation Exam

Module: Orientation Exam  [M-MACH-104162]

Responsibility: 
Organisation: Universität gesamt
Curricular Anchorage: Compulsory
Contained in: Orientation Exam

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<td>Thomas Böhlke, Tom-Alexander Langhoff</td>
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<td>T-MATH-108266</td>
<td>Advanced Mathematics I (S. 33)</td>
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<td>Maria Aksenovich, Stefan Kühnlein</td>
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2 Bachelor Thesis

Module: Bachelor Thesis  [M-MACH-103722]

Responsibility: Martin Heilmaier
Organisation: Werkstoffkunde
Curricular Anchorage: Compulsory
Contained in: Bachelor Thesis

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<td>Presentation (S. 71)</td>
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Learning Control / Examinations

The module Bachelor Thesis consists of a written bachelor thesis and an oral presentation of a scientific subject chosen by the student himself/herself or given by the supervisor. The bachelor’s thesis is designed to show that the student is able to deal with a problem of his/her subject area in an independent manner and within the given period of time using scientific methods.

The work load of the bachelor thesis corresponds to 12 ECTS. The maximal processing time of the bachelor thesis takes three months.

The date of issue of the subject has to be fixed by the supervisor and the student and to be put on record at the examination board. The subject of the bachelor thesis may be only returned once and only within the first month of processing time.

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

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

The colloquium presentation must be held within 6 weeks after the submission of the bachelor thesis. The presentation should last around 20 minutes, corresponds to 3 ECTS, and is followed by a scientific discussion with the present expert audience.

Conditions

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

Qualification Objectives

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

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

Content

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

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

Module: Advanced Mathematics  [M-MATH-104022]

Responsibility: Maria Aksenovich, Stefan Kühnlein
Organisation: KIT-Fakultät für Mathematik
Curricular Anchorage: Compulsory
Contained in: Fundamentals of Engineering

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Learning Control / Examinations
Three written exams for the parts I-III of length 120 minutes each.

Module Grade
The grade for the module is composed from equally weighted grades for the examinations in Advanced Mathematics I-III.

Conditions
None.

Qualification Objectives
The students know the foundations of calculus of one and several variables, linear algebra, theory of differential equations, and probability theory. They know and can apply techniques in these fields.

Content
Basic set theoretic notions, proofs, sequences and convergence, functions and continuity, series, derivatives, integrals, vector spaces, matrices, Laplace transform, functions of several variables, applications of multivariate calculus, Fourier analysis, differential equations, probability.

Literature
- Lecture notes

Workload
In class: 270 hours
FUNDAMENTALS OF ENGINEERING

- lectures, tutorials and examinations

Independent study: 360 hours

- independent review of course material
- work on homework assignments
- preparation for written exams
Module: Engineering Mechanics (BSc-Modul 03, TM) [M-MACH-102572]

Responsibility: Thomas Böhlke, Wolfgang Seemann

Organisation: Institut für Technische Mechanik

Curricular Anchorage: Compulsory

Contained in: Fundamentals of Engineering

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<td>T-MACH-105201</td>
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<td>T-MACH-100284</td>
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</table>

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

prerequisites EM III, IV
“Engineering Mechanics I”, written exam, 90 minutes; graded;
“Engineering Mechanics II”, written exam, 90 minutes; graded;
“Engineering Mechanics III/IV”, written exam, 180 Minutes; graded;
The final grade of this module is computed as ECTS-based weighted sum of the included exams.

Conditions
None

Qualification Objectives
After having finished the lectures EM I and EM II the students can

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

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

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

Contents of “Engineering Mechanics II”: bending; shear; torsion; stress and strain state in 3D; Hooke’s law in 3D; elasticity theories in 3D; energy methods in elastostatics; approximation methods; stability

Contents of “Engineering Mechanics III”:

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:


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

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

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

Workload
lectures and exercises: 204h
homework and preparation of examination: 486h
Module: Manufacturing Processes (MEI)  [M-MACH-104232]

Responsibility: Volker Schulze, Frederik Zanger

Organisational Unit: KIT-Fakultät für Maschinenbau

Curricular Anchorage: Compulsory

Contained in: Fundamentals of Engineering

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<td>4</td>
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Learning Control / Examinations
written exam (duration: 60 min)

Conditions
none

Qualification Objectives
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.

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

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

Workload
regular attendance: 21 hours
self-study: 99 hours
Module: Materials Science (BSc-Modul 04, WK) [M-MACH-102562]

Responsibility: Martin Heilmaier
Organisation: Werkstoffkunde
Curricular Anchorage: Compulsory
Contained in: Fundamentals of Engineering

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Learning Control / Examinations
not graded: participation in 10 lab experiments, introductory colloquia must be passed and 1 short presentation must be presented. The lab course must be finished successfully prior to the registration for the oral exam;
graded: oral exam covering the whole module, 25 minutes.

Conditions
None

Qualification Objectives
Within this Module the students should

- gain knowledge of basics about structural and functional materials
- be able to draw relationships between atomic structure, microstructure and properties
- be able to assess material properties and corresponding applications
Module: Technical Thermodynamics (BSc-Modul 05, TTD) [M-MACH-102574]

Responsibility: Ulrich Maas
Organisation: Institut für Technische Thermodynamik
Curricular Anchorage: Compulsory
Contained in: Fundamentals of Engineering

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<td>Excercises in Technical Thermodynamics and Heat Transfer II (S. 53)</td>
<td>0</td>
<td>Each winter term</td>
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Learning Control / Examinations
Prerequisite: attestation each semester by homework assignments
Thermodynamics I: Written exam, graded, 3 hours
Thermodynamics II: Written exam, graded, 3 hours

Module Grade
weight according to CP

Conditions
None

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

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

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

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

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

Workload
lectures and exercises: 150h
homework and preparation of examination: 300h
Module: Fluid Mechanics (BSc-Modul 12, SL) [M-MACH-102565]

Responsibility: Bettina Frohnapfel
Organization: KIT-Fakultät für Maschinenbau
Curricular Anchorage: Compulsory
Contained in: Fundamentals of Engineering

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<tr>
<td>8</td>
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Compulsory

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<tr>
<td>T-MACH-105207</td>
<td>Fluid Mechanics (S. 54)</td>
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<td>Bettina Frohnapfel</td>
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</table>

Learning Control / Examinations
Common examination of “Fluid Mechanics I” and “Fluid Mechanics II”; written exam, 3 hours (graded)

Module Grade
result of exam

Conditions
none

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

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

Content
properties of fluids, surface tension, hydro- and aerostatics, kinematics, stream tube theory (compressible and incompressible), losses in pipeline systems, dimensional analysis, dimensionless numbers tensor notation, fluid elements in continuum, Reynolds transport theorem, conservation of mass and momentum, continuity equation, constitutive law for Newtonian fluids, Navier-Stokes equations, angular momentum and energy conservation, integral form of the conservation equations, forces between fluids and solids, analytical solutions of the Navier-Stokes equations

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

Literature
Zirep J., Bühler, K.: Grundzüge der Strömungslehre, Grundlagen, Statik und Dynamik der Fluide, Springer Vieweg
Kuhlmann, H.: Strömungsmechanik, Pearson Studium
Spurk, J.H.: Strömungslehre, Einführung in die Theorieder Strömungen, Springer-Verlag
Workload
regular attendance: 64 hours
self-study: 176 hours
Module: Physics [M-PHYS-104030]

Responsibility: Gernot Goll, Bernd Pilawa

Organisation: KIT-Fakultät für Physik

Curricular Anchorage: Compulsory

Contained in: Fundamentals of Engineering

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Compulsory

Identifier Course ECTS Responsibility
T-PHYS-108322 Wave and Quantum Physics (S. 84) 5 Gernot Goll, Bernd Pilawa

Learning Control / Examinations
The assessment consists of a written exam according to Section 4(2), 1 of the examination regulation.

Conditions
None

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

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

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

Workload
150 hours, consisting of attendance times (45), follow-up of the lecture including exam preparation and preparation of exercises (105)
### Module: Electrical Engineering  [M-ETIT-104049]

**Responsibility:** Klaus-Peter Becker  
**Organisation:** KIT-Fakultät für Elektrotechnik und Informationstechnik  
**Curricular Anchorage:** Compulsory  
**Contained in:** Fundamentals of Engineering

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#### Learning Control / Examinations

Written exam, duration 3 hours

#### Conditions

none

#### Remarks

Exam and Lecture will be held in English.
Module: Measurement and Control Systems (BSc-Modul 11, MRT) [M-MACH-102564]

Responsibility: Christoph Stiller
Organisation: KIT-Fakultät für Maschinenbau
Curricular Anchorage: Compulsory
Contained in: Fundamentals of Engineering

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<tr>
<td>T-MACH-104745</td>
<td>Basics in Measurement and Control Systems (S. 43)</td>
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<td>Christoph Stiller</td>
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Learning Control / Examinations
Type of Examination: written exam
Duration of Examination: 150 minutes

Module Grade
result of exam

Conditions
none

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

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

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

Workload
84 hours presence time, 126 hours selfstudies
Module: Computer Science (BSc-Modul 09, Inf) [M-MACH-102563]

Responsibility: Jivka Ovtcharova
Organisation: KIT-Fakultät für Maschinenbau
Curricular Anchorage: Compulsory
Contained in: Fundamentals of Engineering

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Compulsory

Identifier | Course                                      | ECTS | Responsibility  |
-----------|---------------------------------------------|------|-----------------|
T-MACH-105205 | Computer Science for Engineers (S. 45) | 6    | Jivka Ovtcharova |
T-MACH-105206 | Computer Science for Engineers (S. 46) | 0    | Jivka Ovtcharova |

Learning Control / Examinations
Written examination “Computer Science for Engineers”, 100%, 180 minutes; Examination prerequisite: passed lap course.

Module Grade
Examination result “Computer Science for Engineers” 100%

Conditions
None

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

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

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

Workload
Attendance time: 63 hours
Self-study: 117 hours
Module: Mechanical Design (BSc-Modul 06, MKL) [M-MACH-102573]

Responsibility: Albert Albers

Organisation: KIT-Fakultät für Maschinenbau

Curricular Anchorage: Compulsory

Contained in: Fundamentals of Engineering

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<tr>
<td>T-MACH-105286</td>
<td>Mechanical Design I &amp; II (S. 65)</td>
<td>7</td>
<td>Albert Albers, Norbert Burkardt, Sven Matthiesen</td>
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<tr>
<td>T-MACH-104810</td>
<td>Mechanical Design III &amp; IV (S. 68)</td>
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<td>Albert Albers, Norbert Burkardt, Sven Matthiesen</td>
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<tr>
<td>T-MACH-105282</td>
<td>Mechanical Design I, prerequisites (S. 66)</td>
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<tr>
<td>T-MACH-105283</td>
<td>Mechanical Design II, prerequisites (S. 67)</td>
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<tr>
<td>T-MACH-105284</td>
<td>Mechanical Design III, Constructing the Team (S. 69)</td>
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<tr>
<td>T-MACH-105285</td>
<td>Mechanical Design IV, Constructing the Team (S. 70)</td>
<td>0</td>
<td>Albert Albers, Sven Matthiesen</td>
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Learning Control / Examinations

Mechanical Design I & II:
- Preliminary examination: Successful participation in workshops in the field of mechanical design I and II
- Written Examination concerning the teaching program of mechanical design I and II: duration 60 min

Mechanical Design III & IV:
- Preliminary examination: Successful participation in workshops in the field of mechanical design III and IV
- Examination concerning the teaching program of mechanical design III and IV with
  - written part duration 60 min and
  - design part duration 180 min.

Conditions

none

Qualification Objectives

The students are able to . . .

- analyze the function of unknown machine elements.
- use the interpretation and dimensioning guidelines according the common standardization regulations.
- identify technical problems and to work out and evaluate systematic solutions.
- illustrate problem solving’s in technical drawings and cad models according the common standardization regulations.
- estimate the volume and time need of the given tasks and to split them between the team members.
- synthesize the design steps of product engineering by means of a complex technical system.

Content

The Mechanical Design Module provides an introduction to product development and teaches the basics of selected design and machine elements. The focus is on the basics of clutches, gears and gearing. At the same time, skills and tools for visualization (technical drawing) are imparted.

Workload

lectures and exercises: 174h
homework and preparation of examination: 426h
Module: Machines and Processes (mach13BSc-Modul 13, MuP)  
[M-MACH-102566]

Responsibility: Heiko Kubach
Organisation: KIT-Fakultät für Maschinenbau
Curricular Anchorage: Compulsory
Contained in: Fundamentals of Engineering

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Compulsory Courses:

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<tbody>
<tr>
<td>T-MACH-105208</td>
<td>Machines and Processes (S. 61)</td>
<td>7</td>
<td>Hans-Jörg Bauer, Heiko Kubach, Ulrich Maas, Balazs Pritz</td>
</tr>
<tr>
<td>T-MACH-105232</td>
<td>Machines and Processes, Prerequisite (S. 62)</td>
<td>0</td>
<td>Hans-Jörg Bauer, Heiko Kubach, Ulrich Maas, Balazs Pritz</td>
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Learning Control / Examinations
written exam (3 h) and successful lab course

Module Grade
Grade out of written exam (100%)

Conditions
Successful lab course is a precondition to take part at the exam.

Qualification Objectives
The students can name and describe basic energy conversion processes and energy converting machines. They can explain the application of these energy conversion processes in various machines. They can analyze and evaluate the processes and machines in terms of functionality and efficiency and they are able to solve basic technical problems in terms of operating the machines.
Module: Production Operations Management  [M-MACH-100297]

Responsibility: Kai Furmans

Organisation: KIT-Fakultät für Maschinenbau

Curricular Anchorage: Compulsory

Contained in: Fundamentals of Engineering

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Compulsory

Identifier | Course                        | ECTS | Responsibility
-----------|-------------------------------|------|------------------
T-MACH-100304 | Production Operations Management (S. 72) | 5    | Kai Furmans, Gisela Lanza, Frank Schultmann

Learning Control / Examinations
written examn, 90 min, graded

Qualification Objectives
Students are able to:

- describe the connections between production science, work scheduling and design, material flow and basics of economics,
- differentiate between production systems and know their characteristics,
- design workplaces according to the requirements,
- create a material flow system to ensure supply a production system according to the parameters and
- evaluate necessary systems financially.
4 Majors in Mechanical Engineering (International)

Module: MF A: Global Production Management [M-MACH-103351]

Responsibility: Gisela Lanza
Organisation: KIT-Fakultät für Maschinenbau
Curricular Anchorage: Compulsory Elective
Contained in: Majors in Mechanical Engineering (International)

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<tr>
<td>T-MACH-106731</td>
<td>Global Production Engineering (MEI) (S. 58)</td>
<td>4</td>
<td>Gisela Lanza</td>
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<tr>
<td>T-MACH-105379</td>
<td>Global Logistics (S. 57)</td>
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<td>Kai Furmans</td>
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SP A: Globales Produktionsmanagement
Non-Compulsory Block; You must choose at least 8 credits.

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<tr>
<td>T-MACH-106733</td>
<td>SmartFactory@Industry (MEI) (S. 74)</td>
<td>4</td>
<td>Gisela Lanza</td>
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<tr>
<td>T-MACH-105381</td>
<td>Virtual Engineering (Specific Topics) (S. 83)</td>
<td>4</td>
<td>Jivka Ovtcharova</td>
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<td>T-MACH-106732</td>
<td>Automated Production Systems (MEI) (S. 39)</td>
<td>4</td>
<td>Jürgen Fleischer</td>
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Learning Control / Examinations
Oral exams: duration approx. 5 min per credit point
Amount, type and scope of the success control can vary according to the individually choice.

Conditions
None

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

After completion this module, the students are able
- to analyse and solve planning and layout problems on the level of the enterprise, production, processes and work tasks,
- to plan and control a production,
- to evaluate and configure the quality and efficiency of production, processes and products.

Content
The aim of “SP A: Global Production Management” is to present the challenges of globally operating companies and to give an overview of the central aspects of global production networks as well as to gain in-depth knowledge of common methods and procedures for designing them. For this purpose, methods for site selection, approaches for the site-specific adaptation of production technologies as well as planning approaches for setting up a new production location will be imparted during the module. The module will be rounded off by presenting Industry 4.0 methods and technologies. The topics in detail are:
MAJORS IN MECHANICAL ENGINEERING (INTERNATIONAL)

- Framework conditions and influencing factors of global production (historical development, goals, opportunities and risks)
- Site selection
- Site-specific production adaptation
- Planning a new production site
- Design and management of global production networks
- Integration of Industry 4.0 methods and technologies

Recommendations
none

Workload
The work load is about 480 hours, corresponding to 16 credit points.
Module: MF B: Energy Engineering [M-MACH-103350]

Responsibility: Hans-Jörg Bauer
Organisation: KIT-Fakultät für Maschinenbau
Curricular Anchorage: Compulsory Elective
Contained in: Majors in Mechanical Engineering (International)

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**Compulsory**

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<tr>
<td>T-MACH-105220</td>
<td>Fundamentals of Energy Technology (S. 56)</td>
<td>8</td>
<td>Aurelian Florin Badea, Xu Cheng</td>
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**SP B: Energietechnik**
Non-Compulsory Block; You must choose at least 8 credits.

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<td>T-MACH-105213</td>
<td>Fundamentals of Combustion I (S. 55)</td>
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<td>Ulrich Maas, Jörg Sommerer</td>
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<tr>
<td>T-MACH-105292</td>
<td>Heat and Mass Transfer (S. 59)</td>
<td>4</td>
<td>Henning Bockhorn, Ulrich Maas</td>
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**Learning Control / Examinations**
Oral exams: duration approx. 5 min. per credit point.
However, amount, type and scope of the success control can vary according to the individually choice.

**Conditions**
None

**Qualification Objectives**
After completion of SP B students are able

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

**Content**
The aim of SP B “Energy Engineering” is to bring the students closer to the challenges of modern energy systems. The functional principles of conventional and regenerative power plant types are presented and the underlying physical principles of technical combustion and heat and mass transfer are explained. The students learn the basics to evaluate energy systems on a technical and economic basis.

Topics include:
- forms of energy
- energy sources: fossil fuels, nuclear energy, renewable energies
- energy demand structures
- principles of thermal and electrical power plants (conventional and renewable)
- physical basics of technical combustion
- stationary and transient heat and mass transfer phenomena
- environmental aspects of energy production
- role of renewable energies
- conversion, transport and storage of energy
- economic feasibility study of energy systems
- future of the energy sector

**Workload**
The work load is about 480 hours, corresponding to 16 credit points.
Module: MF C: Automotive Engineering  [M-MACH-103349]

Responsibility: Frank Gauterin
Organisation: KIT-Fakultät für Maschinenbau
Curricular Anchorage: Compulsory Elective
Contained in: Majors in Mechanical Engineering (International)

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<td>Automotive Engineering I (S. 40)</td>
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<td>Frank Gauterin, Hans-Joachim Unrau</td>
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</tbody>
</table>

Non-Compulsory Block; You must choose at least 8 credits.

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Course</th>
<th>ECTS</th>
<th>Responsibility</th>
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<tbody>
<tr>
<td>T-MACH-102117</td>
<td>Automotive Engineering II (S. 41)</td>
<td>4</td>
<td>Frank Gauterin, Hans-Joachim Unrau</td>
</tr>
<tr>
<td>T-MACH-105154</td>
<td>Vehicle Comfort and Acoustics I (S. 81)</td>
<td>4</td>
<td>Frank Gauterin</td>
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<tr>
<td>T-MACH-105155</td>
<td>Vehicle Comfort and Acoustics II (S. 82)</td>
<td>4</td>
<td>Frank Gauterin</td>
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<tr>
<td>T-MACH-105210</td>
<td>Machine Dynamics (S. 60)</td>
<td>5</td>
<td>Carsten Proppe</td>
</tr>
<tr>
<td>T-ETIT-100807</td>
<td>Electrical Machines (S. 48)</td>
<td>4</td>
<td>Klaus-Peter Becker</td>
</tr>
</tbody>
</table>

Learning Control / Examinations
Oral exams: duration approx. 5 min. per credit point.
However, amount, type and scope of the success control can vary according to the individually choice.

Conditions
none

Qualification 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 analyse, to evaluate, and to develop the complex system “vehicle”. Further learning objectives according to the selected courses of supplementary subjects.

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. Transmissions: clutches (e.g. friction clutch, visco clutch), transmission (e.g. mechanical transmission, hydraulic fluid...
4 MAJORS IN MECHANICAL ENGINEERING (INTERNATIONAL)

transmission)

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

Workload
The work load is about 480 hours, corresponding to 16 credit points.
5 International Project Management and Soft Skills

Module: International Project Management and Soft Skills  [M-MACH-103322]

Responsibility: Barbara Deml, Stefan Nickel
Organisation: KIT-Fakultät für Maschinenbau
Curricular Anchorage: Compulsory
Contained in: International Project Management and Soft Skills

<table>
<thead>
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Compulsory

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<tbody>
<tr>
<td>T-MACH-105296</td>
<td>Working Methods in Mechanical Engineering (S. 85)</td>
<td>4</td>
<td>Barbara Deml</td>
</tr>
<tr>
<td>T-WIWI-108295</td>
<td>Project and Operations Management (S. 73)</td>
<td>2</td>
<td>Stefan Nickel</td>
</tr>
</tbody>
</table>

Learning Control / Examinations
Success is monitored within the framework of academic achievements.

Conditions
None

Qualification Objectives

- The student gains knowledge of the principles and various instruments of project management and project planning and the acquisition of abilities to plan projects and create controlling systems.
- The student performs an analysis of various methods and procedures of multi-project management and project controlling in a global context.
- The student acquires knowledge of the product development process as well as important parameters of product development and development methods in the context of project management.

Content

Working Methods in Mechanical Engineering:
1. Time and self management
2. Teamwork
3. Literature research
4. Scientific Writing
5. Scientific Presentation

Project and Operations Management:
Students will learn how to structure planning problems occurring in a company’s operations or in international projects. Moreover, they are introduced to fundamental quantitative planning techniques and tools for solving real-world project and operations management problems. Topics of the lecture include:

- Introduction to optimization
- Network planning techniques (CPM, PERT, stochastic time analysis etc.)
- Inventory management (single- and multi-period models etc.)
- Operations scheduling (single and parallel machine scheduling etc.)

Literature

The script and references are available for download on ILIAS.
Workload
The total workload for this module is approximately 180 hours. The total workload per course is obtained from the workload contributing to lecture and exercise attendance, exam hours, and the required time which it takes for an average student with average capacities to achieve the specified learning targets of this module.
Part II
Courses

Course: Advanced Mathematics I [T-MATH-108266]

Responsibility: Maria Aksenovich, Stefan Kühnlein

Contained in: [M-MACH-104162] Orientation Exam
[M-MATH-104022] Advanced Mathematics

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Learning Control / Examinations
Assessment is carried out in form of a written examinations of 120 minutes length.

Conditions
Passing scores for homework and the midterm test are prerequisites for the examination.

Modeled Conditions
The following conditions must be met:

- The course [T-MATH-108265] Advanced Mathematics I Prerequisite must have been passed.
Course: Advanced Mathematics I Prerequisite [T-MATH-108265]

Responsibility: Maria Aksenovich, Stefan Kühnlein
Contained in: [M-MATH-104022] Advanced Mathematics

<table>
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Learning Control / Examinations
Assessment is carried out based on written homework assignments and a midterm test. Exact requirements will be detailed in class.

Conditions
None.
Course: Advanced Mathematics II [T-MATH-108268]

Responsibility: Maria Aksenovich, Stefan Kühnlein
Contained in: [M-MATH-104022] Advanced Mathematics

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**Learning Control / Examinations**
Assessment is carried out in form of a written examinations of 120 minutes length.

**Conditions**
Passing scores for homework and the midterm test are prerequisites for the examination.

**Modeled Conditions**
The following conditions must be met:

- The course [T-MATH-108267] *Advanced Mathematics II Prerequisite* must have been passed.
Course: Advanced Mathematics II Prerequisite [T-MATH-108267]

Responsibility: Maria Aksenovich, Stefan Kühnlein
Contained in: [M-MATH-104022] Advanced Mathematics

<table>
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Learning Control / Examinations
Assessment is carried out based on written homework assignments and a midterm test. Exact requirements will be detailed in class.

Conditions
None.
Course: Advanced Mathematics III [T-MATH-108270]

Responsibility: Maria Aksenovich, Stefan Kühnlein

Contained in: [M-MATH-104022] Advanced Mathematics

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Learning Control / Examinations

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

Conditions

Passing scores for homework and the midterm test are prerequisites for the examination.

Modeled Conditions

The following conditions must be met:

- The course [T-MATH-108269] Advanced Mathematics III Prerequisite must have been passed.
### Course: Advanced Mathematics III Prerequisite [T-MATH-108269]

**Responsibility:** Maria Aksenovich, Stefan Kühnlein  
**Contained in:** [M-MATH-104022] Advanced Mathematics

<table>
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### Learning Control / Examinations
Assessment is carried out based on written homework assignments and a midterm test. Exact requirements will be detailed in class.

### Conditions
None.
Course: Automated Production Systems (MEI) [T-MACH-106732]

Responsibility:  Jürgen Fleischer  
Contained in: [M-MACH-103351] MF A: Global Production Management

ECTS 4  
Recurrence Jedes Sommersemester  
Exam type Prüfungsleistung mündlich  
Version 1

Learning Control / Examinations
oral exam (20 min)

Conditions none
Course: Automotive Engineering I [T-MACH-100092]

Responsibility: Frank Gauterin, Hans-Joachim Unrau

Contained in: [M-MACH-103349] MF C: Automotive Engineering

<table>
<thead>
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<th>ECTS</th>
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<td>Prüfungsleistung schriftlich</td>
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Events

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<tr>
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<th>Events</th>
<th>Type</th>
<th>SWS</th>
<th>Lecturers</th>
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<td>WS 17/18</td>
<td>2113805</td>
<td>Automotive Engineering I</td>
<td>Vorlesung (V)</td>
<td>4</td>
<td>Frank Gauterin, Hans-Joachim Unrau</td>
</tr>
</tbody>
</table>

Learning Control / Examinations

Written examination

Duration: 120 minutes

Auxiliary means: none

Conditions

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

Responsibility: Frank Gauterin, Hans-Joachim Unrau

Contained in: [M-MACH-103349] MF C: Automotive Engineering

<table>
<thead>
<tr>
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<th>Type</th>
<th>SWS</th>
<th>Lecturers</th>
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<tr>
<td>SS 2017</td>
<td>2114835</td>
<td>Automotive Engineering II</td>
<td>Vorlesung (V)</td>
<td>2</td>
<td>Hans-Joachim Unrau</td>
</tr>
</tbody>
</table>

Learning Control / Examinations

Written Examination

Duration: 90 minutes

Auxiliary means: none

Conditions

none
Learning Control / Examinations
The bachelor thesis is designed to show that the student is able to deal with a problem of his/her subject area in an independent manner and within the given period of time using scientific methods. The work load of the bachelor thesis corresponds to 12 ECTS. The maximal processing time of the bachelor thesis takes three months. The date of issue of the subject has to be fixed by the supervisor and the student and to be put on record at the examination board. The subject of the bachelor thesis may be only returned once and only within the first month of processing time.

On a reasoned request of the student, the examination board can extend the processing time by up to one month. If the bachelor thesis is not completed in time, this examination is “failed” (5.0), unless the student is not responsible.

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

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

Remarks
The workload for the preparation of the bachelor thesis is about 360 hours.
# Course: Basics in Measurement and Control Systems [T-MACH-104745]

**Responsibility:** Christoph Stiller  
**Contained in:** [M-MACH-102564] Measurement and Control Systems

<table>
<thead>
<tr>
<th>ECTS</th>
<th>Language</th>
<th>Recurrence</th>
<th>Exam type</th>
<th>Version</th>
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</thead>
<tbody>
<tr>
<td>7</td>
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## Events

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<tr>
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<th>Events</th>
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<th>Lecturers</th>
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<tbody>
<tr>
<td>WS 17/18</td>
<td>2137301</td>
<td>Measurement and Control Systems</td>
<td>Vorlesung (V)</td>
<td>3</td>
<td>Christoph Stiller, Christoph Burger, Johannes Janosovits, Maximilian Naumann</td>
</tr>
<tr>
<td>WS 17/18</td>
<td>2137302</td>
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<td>Übung (Ü)</td>
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<tr>
<td>WS 17/18</td>
<td>3137020</td>
<td>Measurement and Control Systems (Tutorial)</td>
<td>Vorlesung (V)</td>
<td>3</td>
<td>Christoph Stiller, Christoph Burger, Johannes Janosovits, Christoph Stiller</td>
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<tr>
<td>WS 17/18</td>
<td>3137021</td>
<td>Measurement and Control Systems</td>
<td>Übung (Ü)</td>
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</table>

## Learning Control / Examinations

- **written exam**  
  - 2,5 hours

## Conditions

- none
Course: Basics of Manufacturing Technology (MEI) [T-MACH-108747]

Responsibility: Volker Schulze, Frederik Zanger

Contained in: [M-MACH-104232] Manufacturing Processes (MEI)

ECTS: 4
Recurrence: Jedes Wintersemester
Version: 1

Learning Control / Examinations
written exam (duration: 60 min)

Conditions
none
Course: Computer Science for Engineers [T-MACH-105205]

Responsibility:  Jivka Ovtcharova
Contained in:  [M-MACH-102563] Computer Science

<table>
<thead>
<tr>
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<th>Language</th>
<th>Recurrence</th>
<th>Exam type</th>
<th>Version</th>
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<tbody>
<tr>
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Events

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<th>Lecturers</th>
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<tbody>
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<td>2121390</td>
<td>Computer Science for Engineers</td>
<td>Vorlesung (V) / Übung (Ü)</td>
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<td>Jivka Ovtcharova</td>
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<tr>
<td>SS 2017</td>
<td>2121391</td>
<td>Exercises Computer Science for Engineers</td>
<td>Übung (U)</td>
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<td>Mitarbeiter, Jivka Ovtcharova</td>
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<tr>
<td>WS 17/18</td>
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<td>Übung (U)</td>
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<td>Mitarbeiter, Jivka Ovtcharova</td>
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</table>

Learning Control / Examinations
Written exam [180 min]

Conditions
Computer Science for Engineers, passed

Modeled Conditions
The following conditions must be met:
- The course [T-MACH-105206] Computer Science for Engineers must have been passed.
#### Course: Computer Science for Engineers [T-MACH-105206]

**Responsibility:** Jivka Ovtcharova  
**Contained in:** [M-MACH-102563] Computer Science

<table>
<thead>
<tr>
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### Events

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<tbody>
<tr>
<td>SS 2017</td>
<td>2121392</td>
<td>Computer Lab for Computer Science in Mechanical Engineering</td>
<td>Praktische (PÜ)</td>
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<td>Computer Lab for Computer Science in Mechanical Engineering</td>
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<td>Praktische (PÜ)</td>
<td>Übung 2</td>
<td>Mitarbeiter, Jivka Ovtcharova</td>
</tr>
</tbody>
</table>

### Learning Control / Examinations

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.

**Conditions**  
none
Course: Electrical Engineering and Electronics [T-ETIT-108386]

Responsibility: Klaus-Peter Becker

Contained in: [M-ETIT-104049] Electrical Engineering

<table>
<thead>
<tr>
<th>ECTS</th>
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<th>Exam type</th>
<th>Version</th>
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<td>Prüfungsleistung schriftlich</td>
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Learning Control / Examinations
Written exam, duration 3 hours.

Conditions
none
Course: Electrical Machines [T-ETIT-100807]

Responsibility: Klaus-Peter Becker

Contained in: [M-MACH-103349] MF C: Automotive Engineering

<table>
<thead>
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<th>ECTS</th>
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<tbody>
<tr>
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</table>
Course: Engineering Mechanics I [T-MACH-100282]

Responsibility: Thomas Böhlke, Tom-Alexander Langhoff

Contained in: [M-MACH-104162] Orientation Exam
[M-MACH-102572] Engineering Mechanics

<table>
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Events

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<th>Type</th>
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<td>Vorlesung (V)</td>
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<td>3161010</td>
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<td>Vorlesung (V)</td>
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<td>Thomas Böhlke, Tom-Alexander Langhoff</td>
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</table>

Learning Control / Examinations
written exam, 90 min, graded

Conditions
successful participation in “Engineering Mechanics I (Tutorial)” (see T-MACH-100528)

Modeled Conditions
The following conditions must be met:

- The course [T-MACH-100528] Tutorial Engineering Mechanics I must have been passed.
Course: Engineering Mechanics II [T-MACH-100283]

Responsibility: Thomas Böhlke, Tom-Alexander Langhoff

Contained in: [M-MACH-104162] Orientation Exam
[M-MACH-102572] Engineering Mechanics

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<td>Jedes Sommersemester</td>
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Events

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<td>Vorlesung (V)</td>
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<td>Vorlesung (V)</td>
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<td>Thomas Böhlke, Tom-Alexander Langhoff</td>
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</table>

Learning Control / Examinations
written exam, 90 min, graded

Conditions
successful participation in “Engineering Mechanics II (Tutorial)” (see T-MACH-100284)

Modeled Conditions
The following conditions must be met:
- The course [T-MACH-100284] Tutorial Engineering Mechanics II must have been passed.
Course: Engineering Mechanics III & IV [T-MACH-105201]

Responsibility: Wolfgang Seemann
Contained in: [M-MACH-102572] Engineering Mechanics

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Modeled Conditions

The following conditions must be met:

1. The course [T-MACH-105202] Tutorial Engineering Mechanics III must have been passed.
2. The course [T-MACH-105203] Tutorial Engineering Mechanics IV must have been passed.
## Course: Exercises in Technical Thermodynamics and Heat Transfer I

**[T-MACH-105204]**

**Responsibility:** Ulrich Maas  
**Contained in:** [M-MACH-102574] Technical Thermodynamics

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<td>Technical Thermodynamics and Heat Transfer I (Tutorial)</td>
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### Learning Control / Examinations

Homework is mandatory.
Course: Exercises in Technical Thermodynamics and Heat Transfer II
[T-MACH-105288]

Responsibility: Ulrich Maas
Contained in: [M-MACH-102574] Technical Thermodynamics

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Learning Control / Examinations
Homework is mandatory.

Conditions
none
Course: Fluid Mechanics [T-MACH-105207]

Responsibility: Bettina Frohnapfel
Contained in: [M-MACH-102565] Fluid Mechanics

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Learning Control / Examinations
written exam

Conditions
none
## Course: Fundamentals of Combustion I [T-MACH-105213]

**Responsibility:** Ulrich Maas, Jörg Sommerer  
**Contained in:** [M-MACH-103350] MF B: Energy Engineering

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### Learning Control / Examinations

Written exam, 3 h

### Conditions

none
Course: Fundamentals of Energy Technology [T-MACH-105220]

Responsibility: Aurelian Florin Badea, Xu Cheng

Contained in: [M-MACH-103350] MF B: Energy Engineering

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**Learning Control / Examinations**
Written examination, 90 min

**Conditions**
none
Course: Global Logistics [T-MACH-105379]

Responsibility: Kai Furmans

Contained in: [M-MACH-103351] MF A: Global Production Management

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Learning Control / Examinations
oral exam (20 min)

Conditions
none
Course: Global Production Engineering (MEI) [T-MACH-106731]

Responsibility: Gisela Lanza

Contained in: [M-MACH-103351] MF A: Global Production Management

ECTS 4  Language Englisch  Recurrence Jedes Sommersemester  Exam type Prüfungsleistung mündlich  Version 1

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Learning Control / Examinations
oral exam (45 min group examination with 3 students)

Conditions
none
## Course: Heat and Mass Transfer [T-MACH-105292]

**Responsibility:** Henning Bockhorn, Ulrich Maas  
**Contained in:** [M-MACH-103350] MF B: Energy Engineering

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### Learning Control / Examinations

Written exam, 3 h

### Conditions

none
Course: Machine Dynamics [T-MACH-105210]

Responsibility: Carsten Proppe

Contained in: [M-MACH-103349] MF C: Automotive Engineering

ECTS 5
Language Englisch
Recurrence Jedes Sommersemester
Exam type Prüfungsleistung schriftlich
Version 1

Events

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Learning Control / Examinations
written exam, 180 min.

Conditions
none
Course: Machines and Processes [T-MACH-105208]

Responsibility: Hans-Jörg Bauer, Heiko Kubach, Ulrich Maas, Balazs Pritz

Contained in: [M-MACH-102566] Machines and Processes

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Learning Control / Examinations
written exam (duration: 120 min)

Conditions
Taking part at the exam is possible only when lab course has been successfully completed

Modeled Conditions
The following conditions must be met:

- The course [T-MACH-105232] Machines and Processes, Prerequisite must have been passed.
**Course: Machines and Processes, Prerequisite [T-MACH-105232]**

**Responsibility:** Hans-Jörg Bauer, Heiko Kubach, Ulrich Maas, Balazs Pritz

**Contained in:** [M-MACH-102566] Machines and Processes

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</table>

### Learning Control / Examinations

- successful completed training course

### Conditions

- none
# Course: Materials Science I & II [T-MACH-105145]

**Responsibility:** Jens Gibmeier, Martin Heilmaier, Kay Weidenmann  
**Contained in:** [M-MACH-102562] Materials Science

<table>
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## Learning Control / Examinations

**oral exam**

**Modeled Conditions**  
The following conditions must be met:

- The course [T-MACH-105146] *Materials Science Lab Course* must have been passed.
Course: Materials Science Lab Course [T-MACH-105146]

Responsibility: Martin Heilmaier, Anton Möslang, Kay Weidenmann

Contained in: [M-MACH-102562] Materials Science

<table>
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Learning Control / Examinations
Oral colloquium at the beginning of each topic; certificate of successful attendance.

Conditions
none

Remarks
The workload for the lab course Materials Science is 90 h in total and consists of the presence during the 10 experiments (one week half-time, 4 hours per day) as well as preparation and rework time at home.
Course: Mechanical Design I & II [T-MACH-105286]

Responsibility: Albert Albers, Norbert Burkardt, Sven Matthiesen

Contained in: [M-MACH-102573] Mechanical Design

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Learning Control / Examinations
written exam, graded, duration: 60 min

**Conditions**
Admission to the exam only with successful completion of the T-MACH-105282 - Mechanical Design I, prerequisites and T-MACH-105283 - Mechanical Design II, prerequisites.

**Modeled Conditions**
The following conditions must be met:

1. The course [T-MACH-105282] Mechanical Design I, prerequisites must have been passed.
2. The course [T-MACH-105283] Mechanical Design II, prerequisites must have been passed.
Course: Mechanical Design I, prerequisites [T-MACH-105282]

Responsibility: Albert Albers, Sven Matthiesen
Contained in: [M-MACH-102573] Mechanical Design

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Learning Control / Examinations
Concomitant to the lecture, a workshop with 3 workshop sessions takes place over the semester. During the workshop the students are divided into groups and their mechanical design knowledge will be tested during a colloquium at the beginning of every single workshop session. The attendance is mandatory and will be controlled. The pass of the colloquia and the process of the workshop task are required for the successful participation. Furthermore an online test is carried out.

Conditions
none
**Course: Mechanical Design II, prerequisites [T-MACH-105283]**

**Responsibility:** Albert Albers, Sven Matthiesen  
**Contained in:** [M-MACH-102573] Mechanical Design

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**Learning Control / Examinations**

Concomitant to the lecture, 2 online tests are carried out and the knowledge from the lecture will be tested. The knowledge from mechanical design I and II will further be controlled with a design and a CAD task.

**Conditions**

None
Course: Mechanical Design III & IV [T-MACH-104810]

Responsibility:  Albert Albers, Norbert Burkardt, Sven Matthiesen

Contained in:  [M-MACH-102573] Mechanical Design

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**Learning Control / Examinations**

written exam consisting of:

- written part duration 60 min and
- design part duration 180 min

Sum: 240 min

**Conditions**

Admission to the exam only with successful completion of the T-MACH-105284 - Mechanical Design III, Constructing the Team and T-MACH-105285 - Mechanical Design IV, Constructing the Team.

**Modeled Conditions**

1 of 2 conditions must be met:

1. The course [T-MACH-105284] *Mechanical Design III, Constructing the Team* must have been passed.
2. The course [T-MACH-105285] *Mechanical Design IV, Constructing the Team* must have been passed.
Course: Mechanical Design III, Constructing the Team [T-MACH-105284]

Responsibility: Albert Albers, Sven Matthiesen

Contained in: [M-MACH-102573] Mechanical Design

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Learning Control / Examinations
Concomitant to the lecture, a workshop with 3 workshop sessions takes place over the semester. During the workshop the students are divided into groups and their mechanical design knowledge will be tested during a colloquium at the beginning of every single workshop session. The attendance is mandatory and will be controlled. The pass of the colloquia and the process of the workshop task are required for the successful participation.

Conditions
None
Course: Mechanical Design IV, Constructing the Team [T-MACH-105285]

Responsibility: Albert Albers, Sven Matthiesen
Contained in: [M-MACH-102573] Mechanical Design

ECTS: 0  Language: Deutsch/Englisch  Recurrence: Jedes Sommersemester  Exam type: Studienleistung  Version: 2

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Learning Control / Examinations
Concomitant to the lecture, a workshop with 3 workshop sessions takes place over the semester. During the workshop the students are divided into groups and their mechanical design knowledge will be tested during a colloquium at the beginning of every single workshop session. The attendance is mandatory and will be controlled. The pass of the colloquia and the process of the workshop task are required for the successful participation.

Conditions
None
Course: Presentation [T-MACH-108684]

Responsibility: Martin Heilmaier
Contained in: [M-MACH-103722] Bachelor Thesis

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Learning Control / Examinations
The colloquium presentation must be held within 6 weeks after the submission of the bachelor thesis. The presentation should last around 20 minutes followed by a scientific discussion with the present expert audience. The students should show that they are able to independently present and discuss the content of their bachelor thesis according to scientific criteria.

Conditions
Bachelor Thesis has been started

Modeled Conditions
The following conditions must be met:

- The course [T-MACH-108685] Bachelor Thesis must have been started.

Remarks
The workload for the presentation of the bachelor thesis is about 90 hours.
**Course: Production Operations Management [T-MACH-100304]**

**Responsibility:** Kai Furmans, Gisela Lanza, Frank Schultmann  
**Contained in:** [M-MACH-100297] Production Operations Management

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**Learning Control / Examinations**

- *written exam*

**Conditions**

- *none*
Course: Project and Operations Management [T-WIWI-108295]

Responsibility: Stefan Nickel

Contained in: [M-MACH-103322] International Project Management and Soft Skills

ECTS Recurrence Exam type Version
2 Jedes Wintersemester Studienleistung 1

Learning Control / Examinations
Ungraded, the valuation is composed of:

- 50% written exam
- 25% workshop
- 25% case study

Conditions
None

Remarks
Description:
Operations management (OM) describes the process of planning and controlling the resources needed to produce a company’s products or services. While OM focuses on ongoing operations, project management (PM) is concerned with planning and controlling a set of activities with a defined start and end state. The objective of the first part (PM) of the course is to acquaint students with quantitative planning methods to analyze the network structure of large projects, i.e., to identify “critical” project activities, interdependencies between them, and their impact on key performance indicators (e.g., time and cost).

In the second part (OM) of the lecture, two major operational issues are discussed, inventory management and operations scheduling. Students will learn about basic decisions arising in inventory management and operations scheduling, and typical constraints (such as demand or capacity constraints) which have to be taken into account. Throughout the course, students will be given the opportunity to gain practical problem solving skills in short cases and exercises. They will be taught how to use modeling languages in combination with current software tools in order to implement and solve real-world mixed-integer programming models.

Content:
Students will learn how to structure planning problems occurring in a company’s operations or in international projects. Moreover, they are introduced to fundamental quantitative planning techniques and tools for solving real-world project and operations management problems.

Topics of the lecture include:

- Introduction to optimization
- Network planning techniques (CPM, PERT, stochastic time analysis etc.)
- Inventory management (single- and multi-period models etc.)
- Operations scheduling (single and parallel machine scheduling etc.)

Learning Targets:
Participants are capable of

- Formulating basic optimization problems frequently occurring in project and operations management contexts (including linear and integer programming, dynamic programming).
- Systematically examining the network structure of large projects (including identification of relationships between project activities, analysis of time-critical activities, computing expected project duration and costs etc.).
- Distinguishing between the different types and uses of inventory as well as the relevant costs associated with inventory.
- Recognizing the fundamental trade-offs in inventory management.
- Calculating order quantities in case of constant and time-varying demand.
- Classifying various kinds of scheduling problems in short-term production planning
- Sequencing jobs based on priority rules
- Developing schedules for single, parallel, and multiple machines.
Course: SmartFactory@Industry (MEI) [T-MACH-106733]

Responsibility: Gisela Lanza
Contained in: [M-MACH-103351] MF A: Global Production Management

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Learning Control / Examinations
alternative test achievement (graded)

- colloquium (approx. 15 min)
- presentation (approx. 20 min)

Conditions
Successful completion of the following courses:

- M-MACH-102563 - Computer Science
- MACH-102573 - Mechanical Design

Modeled Conditions
The following conditions must be met:

1. The module [M-MACH-102563] Computer Science must have been passed.
2. The module [M-MACH-102573] Mechanical Design must have been passed.
Course: Technical Thermodynamics and Heat Transfer I [T-MACH-104747]

Responsibility: Ulrich Maas

Contained in: [M-MACH-102574] Technical Thermodynamics

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Learning Control / Examinations
Written exam [duration: 180 min]

Conditions
Successful participation in the tutorial (T-MACH-105204 - Exercises in Technical Thermodynamics and Heat Transfer I)

Modeled Conditions
The following conditions must be met:

- The course [T-MACH-105204] Exercises in Technical Thermodynamics and Heat Transfer I must have been passed.
**Course:** Technical Thermodynamics and Heat Transfer II [T-MACH-105287]

**Responsibility:** Ulrich Maas

**Contained in:** [M-MACH-102574] Technical Thermodynamics

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**Learning Control / Examinations**

Written exam [duration: 180 min]

**Conditions**

Successful participation in the tutorial (T-MACH-105288 - Exercises in Technical Thermodynamics and Heat Transfer II)

**Modeled Conditions**

The following conditions must be met:

- The course [T-MACH-105288] *Exercises in Technical Thermodynamics and Heat Transfer II* must have been passed.
**Course: Tutorial Engineering Mechanics I [T-MACH-100528]**

**Responsibility:** Thomas Böhlke, Tom-Alexander Langhoff  
**Contained in:** [M-MACH-102572] Engineering Mechanics  

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**Learning Control / Examinations**

Attestations have to be achieved in the following four categories: mandatory written homework problems, written homework problems, computational homework problems, colloquia.

This course is passed if all mandatory written homework problems are passed and if in the other three categories (written homework problems, computational homework problems, colloquia) in total at most three attestations have been finally not passed, at most one in each of the three categories.

Successful participation in this course allows for registration to the Exam “Engineering Mechanics I” (see T-MACH-100282)

**Conditions**

None
Course: Tutorial Engineering Mechanics II [T-MACH-100284]

Responsibility: Thomas Böhlke, Tom-Alexander Langhoff

Contained in: [M-MACH-102572] Engineering Mechanics

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Learning Control / Examinations

Attestations have to be achieved in the following four categories: mandatory written homework problems, written homework problems, computational homework problems, colloquia.

This course is passed if all mandatory written homework problems are passed and if in the other three categories (written homework problems, computational homework problems, colloquia) in total at most two attestations have been finally not passed, at most one in each of the three categories.

Successful participation in this course allows for registration to the Exam “Engineering Mechanics II” (see T-MACH-100283)

Conditions

None
Course: Tutorial Engineering Mechanics III [T-MACH-105202]

Responsibility: Wolfgang Seemann

Contained in: [M-MACH-102572] Engineering Mechanics

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Learning Control / Examinations
Attestations, successful accomplishment of exercise sheets

Conditions
None
# Course: Tutorial Engineering Mechanics IV [T-MACH-105203]

**Responsibility:** Wolfgang Seemann  
**Contained in:** [M-MACH-102572] Engineering Mechanics

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<td>Übung (U)</td>
<td>2</td>
<td>Jens Burgert, Tim Leister, Wolfgang Seemann</td>
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### Learning Control / Examinations

Attestations, successful accomplishment of exercise sheets
Course: Vehicle Comfort and Acoustics I [T-MACH-105154]

Responsibility: Frank Gauterin

Contained in: [M-MACH-103349] MF C: Automotive Engineering

<table>
<thead>
<tr>
<th>ECTS</th>
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<tr>
<td>4</td>
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Events

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<tr>
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<td>WS 17/18</td>
<td>2113806</td>
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Learning Control / Examinations

Oral Examination

Duration: 30 up to 40 minutes

Auxiliary means: none

Conditions

Can not be combined with lecture T-MACH-102206
Course: Vehicle Comfort and Acoustics II [T-MACH-105155]

Responsibility: Frank Gauterin
Contained in: [M-MACH-103349] MF C: Automotive Engineering

<table>
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**Events**

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<td>SS 2017</td>
<td>2114825</td>
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**Learning Control / Examinations**

Oral Examination

Duration: 30 up to 40 minutes

Auxiliary means: none

**Conditions**

Can not be combined with lecture T-MACH-102205
Course: Virtual Engineering (Specific Topics) [T-MACH-105381]

Responsibility: Jivka Ovtcharova
Contained in: [M-MACH-103351] MF A: Global Production Management

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Events

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<td>Mitarbeiter, Jivka Ovtcharova</td>
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Learning Control / Examinations
oral exam, 20 min.

Conditions
none
Course: Wave and Quantum Physics [T-PHYS-108322]

Responsibility: Gernot Goll, Bernd Pilawa
Content in: [M-PHYS-104030] Physics

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Conditions
none
Course: Working Methods in Mechanical Engineering [T-MACH-105296]

Responsibility: Barbara Deml
Contained in: [M-MACH-103322] International Project Management and Soft Skills

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### Events

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<td>Barbara Deml</td>
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</table>

#### Learning Control / Examinations
Tests within the workshop sessions concerning the topics of the online-lecture as well as active participation during all four workshop sessions.

#### Conditions
none
Index

A
Advanced Mathematics (M) ........................................ 7
Advanced Mathematics I (T) ..................................... 33
Advanced Mathematics I Prerequisite (T) ....................... 34
Advanced Mathematics II (T) .................................... 35
Advanced Mathematics II Prerequisite (T) ....................... 36
Advanced Mathematics III (T) .................................... 37
Advanced Mathematics III Prerequisite (T) ....................... 38
Automated Production Systems (MEI) (T) ....................... 39
Automotive Engineering I (T) ..................................... 40
Automotive Engineering II (T) .................................... 41

B
Bachelor Thesis (M) .................................................. 5
Bachelor Thesis (T) .................................................. 42
Basics in Measurement and Control Systems (T) ............... 43
Basics of Manufacturing Technology (MEI) (T) ............... 44

C
Computer Science (M) .............................................. 21
Computer Science for Engineers (T) ............................ 45 f.

E
Electrical Engineering (M) ......................................... 19
Electrical Engineering and Electronics (T) ....................... 47
Electrical Machines (T) ............................................ 48
Engineering Mechanics (M) ...................................... 9
Engineering Mechanics I (T) ..................................... 49
Engineering Mechanics II (T) .................................... 50
Engineering Mechanics III & IV (T) ............................. 51
Excercises in Technical Thermodynamics and Heat Transfer I (T) .................................................. 52
Excercises in Technical Thermodynamics and Heat Transfer II (T) .................................................. 53

F
Fluid Mechanics (M) .................................................. 16
Fluid Mechanics (T) .................................................. 54
Fundamentals of Combustion I (T) ............................... 55
Fundamentals of Energy Technology (T) ....................... 56

G
Global Logistics (T) .................................................. 57
Global Production Engineering (MEI) (T) ....................... 58

H
Heat and Mass Transfer (T) ...................................... 59

I
International Project Management and Soft Skills (M) ... 31

M
Machine Dynamics (T) ............................................. 60
Machines and Processes (M) ...................................... 23
Machines and Processes (T) ...................................... 61
Machines and Processes, Prerequisite (T) ....................... 62
Manufacturing Processes (MEI) (M) ............................ 11
Materials Science (M) ............................................ 13
Materials Science I & II (T) ...................................... 63
Materials Science Lab Course (T) ................................ 64
Measurement and Control Systems (M) ......................... 20
Mechanical Design (M) ............................................ 22
Mechanical Design I & II (T) .................................... 65
Mechanical Design I, prerequisites (T) .......................... 66
Mechanical Design II, prerequisites (T) ......................... 67
Mechanical Design III & IV (T) .................................. 68
Mechanical Design III, Constructing the Team (T) .......... 69
Mechanical Design IV, Constructing the Team (T) .......... 70
MF A: Global Production Management (M) ................... 25
MF B: Energy Engineering (M) .................................. 27
MF C: Automotive Engineering (M) .......................... 29

O
Orientation Exam (M) .............................................. 4

P
Physics (M) ............................................................... 18
Presentation (T) ....................................................... 71
Production Operations Management (M) ....................... 24
Production Operations Management (T) ....................... 72
Project and Operations Management (T) ....................... 73

T
Technical Thermodynamics (M) ................................ 14
Technical Thermodynamics and Heat Transfer I (T) ........ 75
Technical Thermodynamics and Heat Transfer II (T) ....... 76
Tutorial Engineering Mechanics I (T) .......................... 77
Tutorial Engineering Mechanics II (T) ......................... 78
Tutorial Engineering Mechanics III (T) ......................... 79
Tutorial Engineering Mechanics IV (T) ......................... 80

V
Vehicle Comfort and Acoustics I (T) ........................... 81
Vehicle Comfort and Acoustics II (T) ......................... 82
Virtual Engineering (Specific Topics) (T) ...................... 83

W
Wave and Quantum Physics (T) ................................ 84
Working Methods in Mechanical Engineering (T) ........... 85