Karlsruher Institut für Technologie

Module Handbook
Mechatronics and Information Technology Bachelor Program (B.Sc.)

SPO 2016

Valid from Winter Term 2019/2020

Date: 13.09.2019

KIT DEPARTMENT OF MECHANICAL ENGINEERING / KIT DEPARTMENT OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY

KIT – The Research University in the Helmholtz Association

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1 About this handbook

1.1 Notes and rules

The program exists of several **subjects** (e.g. Fundamentals of Engineering). Every subject is split into **modules** and every module itself consists of one or more interrelated **module component exams**. The extent of every module is indicated by credit points (CP), which will be credited after the successful completion of the module. Some of the modules are **obligatory**. According to the interdisciplinary character of the program, a great variety of **individual specialization and deepening possibilities** exists for a large number of modules. This enables the student to customize content and time schedule of the program according to personal needs, interest and job perspective. The **module handbook** describes the modules belonging to the program. It describes particularly:

- the structure of the modules
- the extent (in CP),
- the dependencies of the modules,
- the learning outcomes,
- the assessment and examinations.

The module handbook serves as a necessary orientation and as a helpful guide throughout the studies. The module handbook does not replace the **course catalog**, which provides important information concerning each semester and variable course details (e.g. time and location of the course).

1.1.1 Begin and completion of a module

Each module and each examination can only be selected once. The decision on the assignment of an examination to a module (if, for example, an examination in several modules is selectable) is made by the student at the moment when he / she is registered for the appropriate examination. A module is completed or passed when the module examination is passed (grade 4.0 or better). For modules in which the module examination is carried out over several partial examinations, the following applies: The module is completed when all necessary module partial examinations have been passed. In the case of modules which offer alternative partial examinations, the module examination is concluded with the examination with which the required total credit points are reached or exceeded. The module grade, however, is combined with the weight of the predefined credit points for the module in the overall grade calculation.

1.1.2 Module versions

It is not uncommon for modules to be revised due to, for example, new courses or cancelled examinations. As a rule, a new module version is created, which applies to all students who are new to the module. On the other hand, students who have already started the module enjoy confidence and remain in the old module version. These students can complete the module on the same conditions as at the beginning of the module (exceptions are regulated by the examination committee). The date of the student's "`binding declaration"' on the choice of the module in the sense of �5(2) of the Study and Examination Regulation is decisive. This binding declaration is made by registering for the first examination in this module.

In the module handbook, all modules are presented in their current version. The version number is given in the module description. Older module versions can be accessed via the previous module handbooks in the archive.

1.1.3 General and partial examinations

Module examinations can be either taken in a general examination or in partial examinations. If the module examination is offered as a general examination, the entire learning content of the module will be examined in a single examamination. If the module examination is subdivided into partial examinations, the content of each course will be examined in corresponding partial examinations. Registration for examinations can be done online at the campus management portal. The following functions can be accessed on https://campus.studium.kit.edu/:

- Register/unregister for examinations
- Check for examination results
- Create transcript of records

For further and more detailed information, https://studium.kit.edu/Seiten/FAQ.aspx.

1.1.4 Types of exams

Exams are split into written exams, oral exams and alternative exam assessments. Exams are always graded. Non exam assessments can be repeated several times and are not graded.

1.1.5 Repeating exams

Principally, a failed written exam, oral exam or alternative exam assessment can repeated only once. If the repeat examination (including an eventually provided verbal repeat examination) will be failed as well, the examination claim is lost. A request for a second repetition has to be made in written form to the examination committee two months after loosing the examination claim.

1.1.6 Additional accomplishments

Additional accomplishments are voluntarily taken exams, which have no impact on the overall grade of the student and can take place on the level of single courses or on entire modules. It is also mandatory to declare an additional accomplishment as such at the time of registration for an exam.

1.1.7 Further information

More detailed information about the legal and general conditions of the program can be found in the examination regulation of the program (**http://www.sle.kit.edu/amtlicheBekanntmachungen.php**).

Qualification Objectives of the Bachelor Program
Mechatronics and Information Technology at KIT

Through a research and practical orientation of the six-semester Bachelor’s degree program in Mechatronics and Information Technology at KIT, graduates of the program are prepared for lifelong learning and employment in typical professional fields of mechatronics in industry, services and public administration. They acquire the academic qualifications to pursue a master’s degree program in Mechatronics and Information Technology or related disciplines.

In the fundamental area of the studies, graduates acquire sound basic knowledge in mathematics, engineering mechanics and electrical engineering.
This is complemented by basic knowledge of mechanical design, automation and information technology, production technology and mechatronic systems and products. With this in-depth knowledge of scientific theories, principles and methods, graduates can successfully deal with clearly specified problems that have a unique solution approach in mechatronics.

In the specialization field and the bachelor thesis, cross-disciplinary problem-solving and synthesis skills for engineering systems are developed. Graduates are able to generate new solutions in the areas of their choice of engineering.

Graduates of the Bachelor program in Mechatronics and Information Technology at KIT can select basic methods in order to create models and compare them in familiar situations. They are able to take over and to work independently on preset problems and resulting tasks in organized teams, to integrate the results of others and to present and interpret their own results in written form. They can identify, analyze and develop systems and processes and apply predefined assessment criteria.

Studienplan für den
Bachelorstudiengang Mechatronik und Informationstechnik

Dieser Studienplan tritt zum 01.10.2018 in Kraft und ist gültig für den Bachelorstudiengang Mechatronik und Informationstechnik gemäß der SPO 2016 (2016_AB_029 vom 10.05.2016) zusammen mit der Änderungssatzung 2018_AB_054, mit redaktionellen Änderungen vom 18.08.2019.

Zusammensetzung der Leistungspunkte (LP) insgesamt

Module im Pflichtfach „Ingenieurwissenschaftliche Grundlagen“: 110 LP
Module im Vertiefungsfach „Vertiefung in der Mechatronik“: 38 LP
Modul im Fach „Überfachliche Qualifikationen“: 2 LP
Berufspraktikum: 15 LP
Bachelorarbeit: 15 LP
Summe: 180 LP

Prüfungsart und -dauer

Angaben über Prüfungsart oder -dauer werden nach § 6 Absatz 2 der Prüfungsordnung für den Bachelorstudiengang fristgerecht bekannt gegeben. Prüfungsart und/oder -dauer können nach § 6 Absatz 2 und 3 geändert werden.

Zusammensetzung der Module im Pflichtfach „Ingenieurwissenschaftliche Grundlagen“

Modul M-MATH-102859 - Höhere Mathematik (21 LP)
- T-MATH-100525 - Übungen zu Höhere Mathematik I
- T-MATH-100275 - Höhere Mathematik I (7 LP)
- T-MATH-100526 - Übungen zu Höhere Mathematik II
- T-MATH-100276 - Höhere Mathematik II (7 LP)
- T-MATH-100527 - Übungen zu Höhere Mathematik III
- T-MATH-100277 - Höhere Mathematik III (7 LP)

Modul M-MACH-102402 - Technische Mechanik (18 LP)
- T-MACH-100528 - Übungen zu Technische Mechanik I
- T-MACH-100282 - Technische Mechanik I (7 LP)
- T-MACH-100284 - Übungen zu Technische Mechanik II
- T-MACH-100283 - Technische Mechanik II (6 LP)
- T-MACH-105202 - Übungen zu Technische Mechanik III
- T-MACH-100299 - Technische Mechanik III (5 LP)

Modul M-ETIT-104519 - Lineare elektrische Netze (9 LP)
- T-ETIT-109317 - Lineare Elektrische Netze – Workshop A (1 LP)
- T-ETIT-109811 - Lineare Elektrische Netze – Workshop B (1 LP)
- T-ETIT-109316 - Lineare Elektrische Netze (7 LP)

Modul M-ETIT-104465 - Elektronische Schaltungen (7 LP)
- T-ETIT-109138 - Elektronische Schaltungen - Workshop (1 LP)
- T-ETIT-109318 - Elektronische Schaltungen (6 LP)

Modul M-ETIT-104428 - Elektromagnetische Felder (6 LP)
- T-ETIT-109078 - Elektromagnetische Felder (6 LP)

Modul M-ETIT-102124 - Elektrische Maschinen und Stromrichter (6 LP)
- T-ETIT-101954 - Elektrische Maschinen und Stromrichter (6 LP)

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Modul M-MACH-101299 - Maschinenkonstruktionslehre (8 LP)
- T-MACH-102132 - Maschinenkonstruktionslehre I, Vorleistung (1 LP)
- T-MACH-102133 - Maschinenkonstruktionslehre II, Vorleistung (1 LP)
- T-MACH-104739 - Maschinenkonstruktionslehre Grundlagen I und II (6 LP)

Modul M-MACH-102549 - Fertigungsprozesse (4 LP)
- T-MACH-105219 - Grundlagen der Fertigungstechnik (4 LP)

Modul M-ETIT-102102 - Digitaltechnik (6 LP)
- T-ETIT-101918 - Digitaltechnik (6 LP)

Modul M-ETIT-104539 - Informationstechnik I (6 LP)
- T-ETIT-109301 - Informationstechnik I - Praktikum (2 LP)
- T-ETIT-109300 - Informationstechnik I (4 LP)

Modul M-ETIT-104525 - Signale und Systeme (7 LP)
- T-ETIT-109314 - Signale und Systeme - Workshop (1 LP)
- T-ETIT-109313 - Signale und Systeme (6 LP)

Modul M-ETIT-102181 - Systemdynamik und Regelungstechnik (6 LP)
- T-ETIT-101921 - Systemdynamik und Regelungstechnik (6 LP)

Modul M-MACH-102749 - Mechatronische Systeme und Produkte (6 LP)
- T-MACH-108680 - Workshop Mechatronische Systeme und Produkte (3 LP)
- T-MACH-105574 - Mechatronische Systeme und Produkte (3 LP)

Zusammensetzung der Module im Vertiefungsfach „Vertiefung in der Mechatronik“

Das Vertiefungsfach setzt sich aus 3 Wahlblöcken zusammen und wird ggfs. von weiteren Ergänzungsmodulen vervollständigt. Die Wahlblöcke und die jeweiligen Wahlmöglichkeiten sind im Folgenden beschrieben.

Vertiefung in der Mechatronik Wahlblock 1: „Elektrotechnik und Informationstechnik“

Wählen Sie in diesem Wahlblock **2 Module in einer zulässigen Kombination** aus der folgenden Liste.

Es sind die folgenden Kombinationen zulässig:
- „Elektroenergiesysteme“ + „Hybride und elektrische Fahrzeuge“
- „Informationstechnik II und Automatisierungstechnik“ + „Praktischer Entwurf Regelungstechnischer Systeme“
- „Wahrscheinlichkeitstheorie“ + „Nachrichtentechnik I“
- „Elektromagnetische Wellen“ + „Grundlagen der Hochfrequenztechnik“

Modul M-ETIT-102156 - Elektroenergiesysteme (5 LP)
- T-ETIT-101923 - Elektroenergiesysteme (5 LP)

Modul M-ETIT-100514 - Hybride und elektrische Fahrzeuge (4 LP)
- T-ETIT-100784 - Hybride und elektrische Fahrzeuge (4 LP)

Modul M-ETIT-104547 - Informationstechnik II und Automatisierungstechnik (4 LP)
- T-ETIT-109319 - Informationstechnik II und Automatisierungstechnik (4 LP)

Modul M-ETIT-103814 - Praktischer Entwurf Regelungstechnischer Systeme (6 LP)
- T-ETIT-108117 - Workshop Praktischer Entwurf Regelungstechnischer Systeme
- T-ETIT-107702 - Praktischer Entwurf Regelungstechnischer Systeme (6 LP)

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Modul M-ETIT-102104 - Wahrscheinlichkeitstheorie (5 LP)
- T-ETIT-101952 - Wahrscheinlichkeitstheorie (5 LP)

Modul M-ETIT-102103 - Nachrichtentechnik I (6 LP)
- T-ETIT-101936 - Nachrichtentechnik I (6 LP)

Modul M-ETIT-104515 - Elektromagnetische Wellen (6 LP)
- T-ETIT-109245 - Elektromagnetische Wellen (6 LP)

Modul M-ETIT-102129 - Grundlagen der Hochfrequenztechnik (6 LP)
- T-ETIT-101955 - Grundlagen der Hochfrequenztechnik (6 LP)

Vertiefung in der Mechatronik Wahlblock 2: „Maschinenbau“

Wählen Sie in diesem Wahlblock **1 Modul** aus der folgenden Liste.
Hinweis: Die meisten dieser Module erstrecken sich über zwei Semester und werden mit jeweils einer einzigen Modulprüfung am Ende abgeschlossen.

Modul M-MACH-102567 - Werkstoffkunde (9 LP)
- T-MACH-105148 - Werkstoffkunde I & II (9 LP)

Modul M-MACH-102386 - Technische Thermodynamik und Wärmeübertragung I (8 LP)
- T-MACH-105204 - Technische Thermodynamik und Wärmeübertragung I, Vorleistung
- T-MACH-104747 - Technische Thermodynamik und Wärmeübertragung I (8 LP)

Modul M-MACH-102565 - Strömungslehre (8 LP)
- T-MACH-105207 - Strömungslehre 1&2 (8 LP)

Modul M-MACH-102829 - Maschinenkonstruktionslehre III + IV (13 LP)
- T-MACH-105284 - Maschinenkonstruktionslehre III, Konstruieren im Team
- T-MACH-105285 - Maschinenkonstruktionslehre IV, Konstruieren im Team
- T-MACH-104810 - Maschinenkonstruktionslehre III & IV (13 LP)

Vertiefung in der Mechatronik Wahlblock 3:

Wählen Sie in diesem Wahlblock **weitere 1 bis 2 Module, bis 8 LP erreicht oder erstmalig überschritten** werden. Dabei können Sie aus den folgenden Modulen **beliebig kombinieren**:
- Verbleibende Module aus der Liste im Wahlblock 1 („Elektro und Informationstechnik“)
- Verbleibende Module aus der Liste im Wahlblock 2 („Maschinenbau“)
- Module aus der folgenden Liste („Informatik“ und „Wirtschaftswissenschaften“):

Modul M-INFO-100803 - Echtzeitsysteme (6 LP)
- T-INFO-101340 - Echtzeitsysteme (6 LP)

Modul M-INFO-103179 - Rechnerorganisation (6 LP)
- T-INFO-103531 - Rechnerorganisation (6 LP)

Modul M-INFO-101174 - Programmieren (6 LP)
- T-INFO-101967 - Programmieren Übungsschein
- T-INFO-101531 - Programmieren (6 LP)

Modul M-INFO-101175 - Softwaretechnik I (6 LP)
- T-INFO-101995 - Softwaretechnik I Übungsschein
- T-INFO-101968 - Softwaretechnik I (6 LP)

Modul M-INFO-100893 - Robotik I - Einführung in die Robotik (6 LP)
- T-INFO-108014 - Robotik I - Einführung in die Robotik (6 LP)

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Modul M-INFO-100757 - Mechano-Informatik in der Robotik (4 LP)
- T-INFO-101294 - Mechano-Informatik in der Robotik (4 LP)

Modul M-WIWI-101418 - Einführung in das Operations Research (9 LP)
- T-WIWI-102758 - Einführung in das Operations Research I und II (9 LP)

Vertiefung in der Mechatronik Ergänzungsbereich

Sofern nach Auswahl der Module in den Wahlblöcken 1 bis 3 in Summe noch keine 38 LP im Vertiefungsfach erreicht sind, müssen Ergänzungsmodule gewählt werden, bis mindestens 38 LP erreicht werden. Nicht zulässig ist es, weitere Module anzumelden, wenn bereits 38 LP erreicht oder erstmalig überschritten wurden.

Als Ergänzungsmodule können alle noch nicht verwendeten Module aus den Wahlblöcken 1 bis 3 ausgewählt werden. (Bereits in den Modulen der Wahlblöcke 1 bis 3 erbrachte Leistungen können gemäß § 7 (5) der SPO nicht nochmal in Ergänzungsmodulen anerkannt werden.)
Weitere Ergänzungsmodule sind im Modulhandbuch aufgeführt.

Zusammensetzung des Moduls im Fach „Überfachliche Qualifikationen“

Das Fach „überfachliche Qualifikationen“ besteht aus dem Modul B-SQ „Schlüsselqualifikationen“ mit 2 Leistungspunkten.

Modul M-MACH-104355 Schlüsselqualifikationen (2 LP)
- T-MACH-105699 - Kooperation in interdisziplinären Teams (2 LP)

Die Vermittlung weiterer überfachlicher Qualifikationen im Umfang von 4 LP gemäß § 16 SPO findet im Rahmen der fachwissenschaftlichen Module „Lineare Elektrische Netze“, „Elektronische Schaltungen“ und „Signale und Systeme“ im Pflichtfach „Ingenieurwissenschaftliche Grundlagen“ statt.
Weitere überfachliche Qualifikationen können als Zusatzleistung erworben werden.

Modul Berufspraktikum

Modul M-MACH-104265 - Berufspraktikum (15 LP)
- T-MACH-108803 - Berufspraktikum (15 LP)

Während des Bachelorstudiums ist ein mindestens 13-wöchiges Berufspraktikum nachweislich abzuleisten, welches geeignet ist, dem Studierenden eine Anschauung von berufspraktischer Tätigkeit in Mechatronik und Informationstechnik zu vermitteln. Näheres regeln die Praktikantenrichtlinien. Dem Berufspraktikum sind 15 Leistungspunkte zugeordnet. Das Berufspraktikum geht nicht in die Gesamtnote ein. Zeiten einer Berufsausbildung können als Berufspraktikum anerkannt werden. Die Anerkennung erfolgt durch das zuständige Praktikantenamt.

Modul Bachelorarbeit

Modul M-MACH-104262 - Bachelorarbeit (15 LP)
- T-MACH-107760 - Präsentation (3 LP)
- T-MACH-108800 - Bachelorarbeit (12 LP)

Das Modul Bachelorarbeit hat einen Umfang von 15 LP. Es besteht aus der Bachelorarbeit mit 12 LP und einer Präsentation mit 3 LP. Die Bachelorarbeit kann von jedem Hochschullehrer/in der KIT-Fakultäten Elektrotechnik und Informationstechnik und Maschinenbau vergeben und betreut werden.
Die maximale Bearbeitungsdauer beträgt sechs Monate. Voraussetzung zur Zulassung zur Bachelorarbeit ist, dass der/die Studierende Modulprüfungen im Umfang von 120 LP erfolgreich abgelegt hat.
Die Note des Moduls Bachelorarbeit wird bei der Bildung der Gesamtnote mit dem doppelten Gewicht berücksichtigt (SPO § 21(2)).

Studienplan BSc Mechatronik und Informationstechnik

Orientierungsprüfung

Die Orientierungsprüfung nach SPO § 8 besteht aus der Teilmodulprüfung „Technische Mechanik I“ im Modul „Technische Mechanik“ und der Modulprüfung „Lineare elektrische Netze“.

Zusätzliche Leistungen

Es können nach SPO § 15 (1) auch Leistungen mit bis zu 30 Leistungspunkten mehr erworben werden, als für das Bestehen der Bachelorprüfung erforderlich sind. Die Studierenden haben bereits bei der Anmeldung zu einer Prüfung in einem Modul diese als Zusatzleistung zu deklarieren.

Mastervorzug

Studierende, die bereits mindestens 120 LP erworben haben, können gemäß SPO § 15 a Leistungspunkte aus einem konsekutiven Masterstudiengang am KIT im Umfang von höchstens 30 LP erwerben. Die Studierenden haben bereits bei der Anmeldung zu einer Prüfung in einem Modul diese als Mastervorzug zu deklarieren.

Studienplan BSc Mechatronik und Informationstechnik

Exemplarischer Studienablaufplan

Sem.	Fach	Modul	Teilleistungen	LP	Prüfung / Studienleistung
1	Ingenieurwissenschaftliche Grundlagen	M-MATH-102859	T-MATH-100525 - Übungen zu Höhere Mathematik I T-MATH-100275 - Höhere Mathematik I	 7	Studienleistung Prüfung
		M-MACH-102402	T-MACH-100528 - Übungen zu Technische Mechanik I T-MACH-100282 - Technische Mechanik I	 7	Studienleistung Prüfung
		M-ETIT-104519	T-ETIT-109317 - Lineare Elektrische Netze - Workshop A T-ETIT-109811 - Lineare Elektrische Netze - Workshop B T-ETIT-109316 - Lineare Elektrische Netze	1 1 7	Studienleistung Prüfung
		M-ETIT-102102	T-ETIT-101918 - Digitaltechnik	6	Prüfung
		M-MACH-101299	T-MACH-102132 - Maschinenkonstruktionslehre I, Vorleistung	1	Studienleistung
2	Ingenieurwissenschaftliche Grundlagen	M-MATH-102859	T-MATH-100526 - Übungen zu Höhere Mathematik II T-MATH-100276 - Höhere Mathematik II	 7	Studienleistung Prüfung
		M-MACH-102402	T-MACH-100284 - Übungen zu Technische Mechanik II T-MACH-100283 - Technische Mechanik II	 6	Studienleistung Prüfung
		M-ETIT-104465	T-ETIT-109138 - Elektronische Schaltungen - Workshop T-ETIT-109318 - Elektronische Schaltungen	1 6	Studienleistung Prüfung
		M-ETIT-104428	T-ETIT-109078 - Elektromagnetische Felder	6	Prüfung
		M-MACH-101299	T-MACH-102133 - Maschinenkonstruktionslehre II, Vorleistung T-MACH-104739 - Maschinenkonstruktionslehre Grundlagen I und II	1 6	Studienleistung Prüfung
3	Ingenieurwissenschaftliche Grundlagen	M-MATH-102859	T-MATH-100527 - Übungen zu Höhere Mathematik III T-MATH-100277 - Höhere Mathematik III	7	Studienleistung Prüfung
		M-MACH-102402	T-MACH-105202 - Übungen zu Technische Mechanik III T-MACH-100299 - Technische Mechanik III	5	Studienleistung Prüfung
		M-ETIT-102124	T-ETIT-101954 - Elektrische Maschinen und Stromrichter	6	Prüfung
		M-ETIT-104525	T-ETIT-109314 - Signale und Systeme - Workshop T-ETIT-109313 - Signale und Systeme	1 6	Studienleistung Prüfung
		M-MACH-102549	T-MACH-105219 - Grundlagen der Fertigungstechnik	4	Prüfung
4	Ingenieur-wissen-schaftliche Grundla-gen	M-ETIT-104539	T-ETIT-109301 - Informationstechnik I - Praktikum T-ETIT-109300 - Informationstechnik I	2 4	Prüfung Prüfung
	Vertiefung in der Me-chatronik		siehe S. 2 bis 4 und 7	22	
5	Ingenieurwissen-schaftliche Grundla-gen	M-MACH-102749	T-MACH-108680 - Workshop Mechatronische Systeme und Produkte T-MACH-105574 - Mechatronische Systeme und Produkte	 3 3	 Prüfung Prüfung
		M-ETIT-102181	T-ETIT-101921 - Systemdynamik und Regelungstechnik	6	Prüfung
	Überfachli-che Qualifi-kationen	M-MACH-104355	T-MACH-105699 - Kooperation in interdisziplinären Teams	2	Studienleistung
	Vertiefung in der Me-chatronik		siehe S. 2 bis 4 und 7	16	
6		M-MACH-104265	T-MACH-108803 - Berufspraktikum	15	Studienleistung
		M-MACH-104262	T-MACH-107760 - Präsentation T-MACH-108800 - Bachelorarbeit	3 12	Studienleistung Abschlussarbeit

Gültig für den BSc MIT gemäß SPO 2016 (2016_AB_029) und der Änderungssatzung 2018 (2018_AB_054) vom 28.09.2018, mit redaktionellen Änderungen vom 18.08.2019 Seite 6 von 7

Studienplan BSc Mechatronik und Informationstechnik

Exemplarische Wahloption

Die exemplarische Wahloption zeigt beispielhaft ***eine*** zulässige Kombination von Modulen im ***Vertiefungsfach***, mit der exakt die angegebenen Leistungspunkte im 4. und 5. Semester erreicht werden können.

Sem.	Wahlblock	Modul	Teilleistungen	LP	Prüfung / Studienleistung
3	Wahlblock 2	M-MACH-102829	T-MACH-105284 - Maschinenkonstruktionslehre III, Konstruieren im Team		Studienleistung
4	Wahlblock 1	M-ETIT-102156	T-ETIT-101923 - Elektroenergiesysteme	5	Prüfung
	Wahlblock 2	M-MACH-102829	T-MACH-105285 - Maschinenkonstruktionslehre IV, Konstruieren im Team T-MACH-104810 - Maschinenkonstruktionslehre III & IV	 13	Studienleistung Prüfung
	Wahlblock 3	M-ETIT-104547	T-ETIT-109319 - Informationstechnik II und Automatisierungstechnik	4	Prüfung
5	Wahlblock 1	M-ETIT-100514	T-ETIT-100784 - Hybride und elektrische Fahrzeuge	4	Prüfung
	Wahlblock 3	M-ETIT-103814	T-ETIT-108117 - Workshop Praktischer Entwurf Regelungstechnischer Systeme T-ETIT-107702 - Praktischer Entwurf Regelungstechnischer Systeme	 6	Studienleistung Prüfung
	Ergänzungsbereich	M-INFO-100893	T-INFO-108014 - Robotik I - Einführung in die Robotik	6	Prüfung

WS 2019-2020	B.Sc. Mechatronik und Informationstechnik: 1. Fachsemester, Ingenieurwiss. Grundlagen				
Zeit	**Montag**	**Dienstag**	**Mittwoch**	**Donnerstag**	**Freitag**
08:00 - 09:30	**0131300** Höhere Mathematik I (Üb) HS a.F.			**2145132** Maschinenkonstruktionslehre I (Üb) Daimler	**2305256** Lineare elektrische Netze Benz
09:45 - 11:15	**2161245** Technische Mechanik I Audimax	**2311615** Digitaltechnik Daimler		**2305256** Lineare elektrische Netze Daimler	
11:30 - 13:00				**2311615** Digitaltechnik (14-tägl) Daimler **2311617** Digitaltechnik (Üb) (14-tägl) Daimler	
13:00 - 14:00					
14:00 - 15.30			**2305258** Lineare elektrische Netze (Üb) Daimler	**2161245** Technische Mechanik I Audimax	**0131200** Höhere Mathematik I 20.40 Fritz-Haller HS
15:45 - 17:15	**0131200** Höhere Mathematik I Gaede				**2161246** Technische Mechanik I (Üb) Daimler / Audimax
17:30 - 19:00		**2145131** Maschinenkonstruktionslehre I Benz			

Stand: 10.09.2019

Vorlesung	Übung	Workshop

2307905 Lineare elektrische Netze - Workshop A Termine siehe Institutshomepage	**2305906** Lineare elektrische Netze - Workshop B Termine siehe Institutshomepage	**2311170** Tutorien zu 2311615 Digitaltechnik Termine siehe Institutshomepage

WS 2019-2020	B.Sc. Mechatronik und Informationstechnik: 3. Fachsemester, Ingenieurwiss. Grundlagen				
Zeit	**Montag**	**Dienstag**	**Mittwoch**	**Donnerstag**	**Freitag**
08:00 - 09:30		**2302111** Signale und Systeme (Üb) Gaede	**0131400** Höhere Mathematik III Audimax	**2306389** Elektrische Maschinen und Stromrichter (Üb) 20.40 Fritz-Haller HS	**2302109** Signale und Systeme Tulla HS
09:45 - 11:15	**2306387** Elektrische Maschinen und Stromrichter MTI		**2149658** Grundlagen der Fertigungstechnik Gerthsen		**0131400** Höhere Mathematik III Gerthsen
11:30 - 13:00	**2161203** Technische Mechanik III HS a.F.				
13:00 - 14:00					
14:00 - 15.30				**2161204** Technische Mechanik III (Üb) Daimler / Benz	
15:45 - 17:15				**0131500** Höhere Mathematik III (Üb) Gerthsen	
17:30 - 19:00					

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Vorlesung	Übung	Workshop

2302905 Signale und Systeme – Workshop Termine siehe Institutshomepage

WS 2019-2020	B.Sc. Mechatronik und Informationstechnik: 5. Fachsemester				
Zeit	Montag	Dienstag	Mittwoch	Donnerstag	Freitag
08:00 - 09:30					
09:45 - 11:15					
11:30 - 13:00		**2303161** Mechatronische Systeme und Produkte (+Üb.) 10.50 Großer HS			
13:00 - 14:00					
14:00 - 15.30				**2303003** Mechatronische Systeme und Produkte (+Üb.) 11.10 EAS	
15:45 - 17:15					
17:30 - 19:00					

Stand: 10.09.2019

Vorlesung	Übung	Praktikum

2145166 Kooperation in interdisziplinären Teams Ort und Zeit s. Homepage	**2145162** Workshop Mechatronische Systeme und Produkte Ort und Zeit s. Homepage	2303155 Systemdynamik und Regelungstechnik

WS 2019-2020	B.Sc. Mechatronik und Informationstechnik: Wahlpflichtfächer				
Zeit	Montag	Dienstag	Mittwoch	Donnerstag	Freitag
08:00 - 09:30	**2165503** Techn. Thermodynamik und Wärmeübertragung I (Tu) Hertz, Nusselt	**2165503** Techn. Thermodynamik und Wärmeübertragung I (Tu) Oberer HS		**2165503** Technische Thermodynamik und Wärmeübertragung I (Tu) 10.50 Großer HS	**2165502** Techn. Thermod. und Wärmeü. I (Üb) Gerthsen **2181555** Werkstoffkunde I (+Üb) Audimax
09:45 - 11:15		**2165503** Techn. Thermodynamik u. Wärmeübertragung I (Tu) 50.31 SR 107	**2153512** Strömungslehre II (+Üb) HS a.F. **2310505** Wahrscheinlichkeitstheorie 30.10 NTI **2306321** Hybride und elektr. Fahrzeuge EAS	**2165501** Techn. Therm. u. Wärmeüb. I HS a.F. **2530043** Einführung in das Operations Research II Tulla HS **2400077** Mechano-Informatik in der Robotik 50.34 R -102	
11:30 - 13:00	**2309456** Halbleiterbauelemente 30.10 NTI	**2181555** Werkstoffkunde I (+Üb) Tulla HS	**2165503** Techn. Thermodynamik und Wärmeübertragung I (Tu) 10.91 Mittlerer HS	**2145153** MKL III (Üb) Audimax **2304206** Passive Bauelemente 30.33 MTI	**2153512** Strömungslehre II (+ Üb) HS a.F. **2165503** Technische Thermodynamik und Wärmeübertragung I (Tu) 20.40 Neuer HS
13:00 - 14:00					
14:00 - 15.30	**2310507** Wahrscheinlichkeitstheorie (Üb) 30.33 MTI **24502** Rechnerorganisation Audimax	**2165501** Techn. Thermodynamik und Wärmeübertragung I Gerthsen **2306323** Hybride u. elektr. Fahrzeuge (Üb) EAS **2309457** Halbleiterbauelemente (Üb) IPQ R 3.42	**24004** Programmieren (+Üb) Audimax, 50.34 R -101, 50.34 R -102 **24502** Rechnerorganisation HS a.F.		**2309457** Halbleiterbauelemente (Üb) 30.33 MTI, 30.10 NTI
15:45 - 17:15	**2304208** Passive Bauelemente (Üb) Daimler	**2145151** MKL III Benz / Daimler			
17:30 - 19:00	**2424152** Robotik I - Einf. in die Robotik (+Üb) HS a.F.			**2424152** Robotik I - Einführung in die Robotik (+Üb) HS a.F.	

Stand: 10.09.2019

Vorlesung	Übung / Tutorium

Karlsruher Institut für Technologie

Die Forschungsuniversität in der Helmholtz-Gemeinschaft

Amtliche Bekanntmachung

2016 **Ausgegeben Karlsruhe, den 10. Mai 2016** **Nr. 29**

I n h a l t **Seite**

Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Bachelorstudiengang Mechatronik und Informationstechnik

vom 03. Mai 2016

Aufgrund von § 10 Absatz 2 Ziff. 5 und § 20 des Gesetzes über das Karlsruher Institut für Technologie (KIT-Gesetz - KITG) in der Fassung vom 14. Juli 2009 (GBl. S. 317 f), zuletzt geändert durch Artikel 5 des Dritten Gesetzes zur Änderung hochschulrechtlicher Vorschriften (3. Hochschulrechtsänderungsgesetz – 3. HRÄG) vom 01. April 2014 (GBl. S. 99, 167) und § 8 Absatz 5 des Gesetzes über die Hochschulen in Baden-Württemberg (Landeshochschulgesetz - LHG) in der Fassung vom 1. Januar 2005 (GBl. S. 1 f), zuletzt geändert durch Artikel 3 des Gesetzes zur Verbesserung von Chancengerechtigkeit und Teilhabe in Baden-Württemberg vom 01. Dezember 2015 (GBl. S. 1047, 1052), hat der Senat des KIT am 18. April 2016 die folgende Studien- und Prüfungsordnung für den Bachelorstudiengang Mechatronik und Informationstechnik beschlossen.

Der Präsident hat seine Zustimmung gemäß § 20 Absatz 2 KITG i.V.m. § 32 Absatz 3 Satz 1 LHG am 03. Mai 2016 erteilt.

Inhaltsverzeichnis

Präambel

Das KIT hat sich im Rahmen der Umsetzung des Bolognaprozesses zum Aufbau eines europäischen Hochschulraumes zum Ziel gesetzt, dass am Abschluss des Studiums am KIT der Mastergrad stehen soll. Das KIT sieht daher die am KIT angebotenen konsekutiven Bachelor- und Masterstudiengänge als Gesamtkonzept mit konsekutivem Curriculum.

I. Allgemeine Bestimmungen

§ 1 Geltungsbereich

Diese Bachelorprüfungsordnung regelt Studienablauf, Prüfungen und den Abschluss des Studiums im Bachelorstudiengang Mechatronik und Informationstechnik am KIT. Dieser Studiengang wird gemeinsam von der KIT-Fakultät für Elektrotechnik und Informationstechnik sowie der KIT-Fakultät für Maschinenbau am KIT angeboten.

§ 2 Ziel des Studiums, akademischer Grad

(1) Im Bachelorstudium sollen die wissenschaftlichen Grundlagen und die Methodenkompetenz der Fachwissenschaften vermittelt werden. Ziel des Studiums ist die Fähigkeit, einen konsekutiven Masterstudiengang erfolgreich absolvieren zu können sowie das erworbene Wissen berufsfeldbezogen anwenden zu können.

(2) Aufgrund der bestandenen Bachelorprüfung wird der akademische Grad „Bachelor of Science (B.Sc.)“ für den Bachelorstudiengang Mechatronik und Informationstechnik verliehen.

§ 3 Regelstudienzeit, Studienaufbau, Leistungspunkte

(1) Der Studiengang nimmt teil am Programm „Studienmodelle individueller Geschwindigkeit“. Die Studierenden haben im Rahmen der dortigen Kapazitäten und Regelungen bis einschließlich drittem Fachsemester Zugang zu den Veranstaltungen des MINT-Kollegs Baden-Württemberg (im folgenden MINT-Kolleg).

(2) Die Regelstudienzeit beträgt sechs Semester. Bei einer qualifizierten Teilnahme am MINT-Kolleg bleiben bei der Anrechnung auf die Regelstudienzeit bis zu zwei Semester unberücksichtigt. Die konkrete Anzahl der Semester richtet sich nach § 8 Absatz 2 Satz 3 bis 5. Eine qualifizierte Teilnahme liegt vor, wenn die Studierenden Veranstaltungen des MINT-Kollegs für die Dauer von mindestens einem Semester im Umfang von mindestens zwei Fachkursen (Gesamtworkload 10 Semesterwochenstunden) belegt hat. Das MINT-Kolleg stellt hierüber eine Bescheinigung aus.

(3) Das Lehrangebot des Studiengangs ist in Fächer, die Fächer sind in Module, die jeweiligen Module in Lehrveranstaltungen gegliedert. Die Fächer und ihr Umfang werden in § 20 festgelegt. Näheres beschreibt das Modulhandbuch.

(4) Der für das Absolvieren von Lehrveranstaltungen und Modulen vorgesehene Arbeitsaufwand wird in Leistungspunkten (LP) ausgewiesen. Die Maßstäbe für die Zuordnung von Leistungspunkten entsprechen dem European Credit Transfer System (ECTS). Ein Leistungspunkt entspricht einem Arbeitsaufwand von etwa 30 Zeitstunden. Die Verteilung der Leistungspunkte auf die Semester hat in der Regel gleichmäßig zu erfolgen.

(5) Der Umfang der für den erfolgreichen Abschluss des Studiums erforderlichen Studien- und Prüfungsleistungen wird in Leistungspunkten gemessen und beträgt insgesamt 180 Leistungspunkte.

(6) Lehrveranstaltungen können nach vorheriger Ankündigung auch in englischer Sprache angeboten werden, sofern es deutschsprachige Wahlmöglichkeiten gibt.

§ 4 Modulprüfungen, Studien- und Prüfungsleistungen

(1) Die Bachelorprüfung besteht aus Modulprüfungen. Modulprüfungen bestehen aus einer oder mehreren Erfolgskontrollen. Erfolgskontrollen gliedern sich in Studien- oder Prüfungsleistungen.

(2) Prüfungsleistungen sind:

1. schriftliche Prüfungen,
2. mündliche Prüfungen oder
3. Prüfungsleistungen anderer Art.

(3) Studienleistungen sind schriftliche, mündliche oder praktische Leistungen, die von den Studierenden in der Regel lehrveranstaltungsbegleitend erbracht werden. Die Bachelorprüfung darf nicht mit einer Studienleistung abgeschlossen werden.

(4) Von den Modulprüfungen sollen mindestens 70 % benotet sein.

(5) Bei sich ergänzenden Inhalten können die Modulprüfungen mehrerer Module durch eine auch modulübergreifende Prüfungsleistung (Absatz 2 Nr.1 bis 3) ersetzt werden.

§ 5 Anmeldung und Zulassung zu den Modulprüfungen und Lehrveranstaltungen

(1) Um an den Modulprüfungen teilnehmen zu können, müssen sich die Studierenden online im Studierendenportal zu den jeweiligen Erfolgskontrollen anmelden. In Ausnahmefällen kann eine Anmeldung schriftlich im Studierendenservice oder in einer anderen vom Studierendenservice autorisierten Einrichtung erfolgen. Für die Erfolgskontrollen können durch die Prüfenden Anmeldefristen festgelegt werden. Die Anmeldung der Bachelorarbeit ist im Modulhandbuch geregelt.

(2) Sofern Wahlmöglichkeiten bestehen, müssen Studierende, um zu einer Prüfung in einem bestimmten Modul zugelassen zu werden, vor der ersten Prüfung in diesem Modul mit der Anmeldung zu der Prüfung eine bindende Erklärung über die Wahl des betreffenden Moduls und dessen Zuordnung zu einem Fach abgeben. Auf Antrag des/der Studierenden an den Prüfungsausschuss kann die Wahl oder die Zuordnung nachträglich geändert werden. Sofern bereits ein Prüfungsverfahren in einem Modul begonnen wurde, ist die Änderung der Wahl oder der Zuordnung erst nach Beendigung des Prüfungsverfahrens zulässig.

(3) Zu einer Erfolgskontrolle ist zuzulassen, wer

1. in den Bachelorstudiengang Mechatronik und Informationstechnik am KIT eingeschrieben ist; die Zulassung beurlaubter Studierender ist auf Prüfungsleistungen beschränkt; und

2. nachweist, dass er die im Modulhandbuch für die Zulassung zu einer Erfolgskontrolle festgelegten Voraussetzungen erfüllt und

3. nachweist, dass er in dem Bachelorstudiengang Mechatronik und Informationstechnik den Prüfungsanspruch nicht verloren hat und

4. die in § 20 a genannte Voraussetzung erfüllt.

(4) Nach Maßgabe von § 30 Abs. 5 LHG kann die Zulassung zu einzelnen Pflichtveranstaltungen beschränkt werden. Der/die Prüfende entscheidet über die Auswahl unter den Studierenden, die sich rechtzeitig bis zu dem von dem/der Prüfenden festgesetzten Termin angemeldet haben unter Berücksichtigung des Studienfortschritts dieser Studierenden und unter Beachtung von § 13 Abs. 1 Satz 1 und 2, sofern ein Abbau des Überhangs durch andere oder zusätzliche Veranstaltungen nicht möglich ist. Für den Fall gleichen Studienfortschritts sind durch die KIT-Fakultäten weitere Kriterien festzulegen. Das Ergebnis wird den Studierenden rechtzeitig bekannt gegeben.

(5) Die Zulassung ist abzulehnen, wenn die in Absatz 3 und 4 genannten Voraussetzungen nicht erfüllt sind.

§ 6 Durchführung von Erfolgskontrollen

(1) Erfolgskontrollen werden studienbegleitend, in der Regel im Verlauf der Vermittlung der Lehrinhalte der einzelnen Module oder zeitnah danach, durchgeführt.

(2) Die Art der Erfolgskontrolle (§ 4 Abs. 2 Nr. 1 bis 3, Abs. 3) wird von der/dem Prüfenden der betreffenden Lehrveranstaltung in Bezug auf die Lerninhalte der Lehrveranstaltung und die Lernziele des Moduls festgelegt. Die Art der Erfolgskontrolle, ihre Häufigkeit, Reihenfolge und Gewichtung sowie gegebenenfalls die Bildung der Modulnote müssen mindestens sechs Wochen vor Vorlesungsbeginn im Modulhandbuch bekannt gemacht werden. Im Einvernehmen von Prüfendem und Studierender bzw. Studierendem können die Art der Prüfungsleistung sowie die Prüfungssprache auch nachträglich geändert werden; im ersten Fall ist jedoch § 4 Abs. 5 zu berücksichtigen. Bei der Prüfungsorganisation sind die Belange Studierender mit Behinderung oder chronischer Erkrankung gemäß § 13 Abs. 1 zu berücksichtigen. § 13 Abs. 1 Satz 3 und 4 gelten entsprechend.

(3) Bei unvertretbar hohem Prüfungsaufwand kann eine schriftlich durchzuführende Prüfungsleistung auch mündlich, oder eine mündlich durchzuführende Prüfungsleistung auch schriftlich abgenommen werden. Diese Änderung muss mindestens sechs Wochen vor der Prüfungsleistung bekannt gegeben werden.

(4) Bei Lehrveranstaltungen in englischer Sprache (§ 3 Abs. 6) können die entsprechenden Erfolgskontrollen in dieser Sprache abgenommen werden. § 6 Abs. 2 gilt entsprechend.

(5) *Schriftliche Prüfungen* (§ 4 Abs. 2 Nr. 1) sind in der Regel von einer/einem Prüfenden nach § 18 Abs. 2 oder 3 zu bewerten. Sofern eine Bewertung durch mehrere Prüfende erfolgt, ergibt sich die Note aus dem arithmetischen Mittel der Einzelbewertungen. Entspricht das arithmetische Mittel keiner der in § 7 Abs. 2 Satz 2 definierten Notenstufen, so ist auf die nächstliegende Notenstufe auf- oder abzurunden. Bei gleichem Abstand ist auf die nächstbessere Notenstufe zu runden. Das Bewertungsverfahren soll sechs Wochen nicht überschreiten. Schriftliche Prüfungen dauern mindestens 60 und höchstens 300 Minuten.

(6) *Mündliche Prüfungen* (§ 4 Abs. 2 Nr. 2) sind von mehreren Prüfenden (Kollegialprüfung) oder von einer/einem Prüfenden in Gegenwart einer oder eines Beisitzenden als Gruppen- oder Einzelprüfungen abzunehmen und zu bewerten. Vor der Festsetzung der Note hört die/der Prüfende die anderen an der Kollegialprüfung mitwirkenden Prüfenden an. Mündliche Prüfungen dauern in der Regel mindestens 15 Minuten und maximal 60 Minuten pro Studierenden.

Die wesentlichen Gegenstände und Ergebnisse der *mündlichen Prüfung* sind in einem Protokoll festzuhalten. Das Ergebnis der Prüfung ist den Studierenden im Anschluss an die mündliche Prüfung bekannt zu geben.

Studierende, die sich in einem späteren Semester der gleichen Prüfung unterziehen wollen, werden entsprechend den räumlichen Verhältnissen und nach Zustimmung des Prüflings als Zuhörerinnen und Zuhörer bei mündlichen Prüfungen zugelassen. Die Zulassung erstreckt sich nicht auf die Beratung und Bekanntgabe der Prüfungsergebnisse.

(7) Für *Prüfungsleistungen anderer Art* (§ 4 Abs. 2 Nr. 3) sind angemessene Bearbeitungsfristen einzuräumen und Abgabetermine festzulegen. Dabei ist durch die Art der Aufgabenstellung und durch entsprechende Dokumentation sicherzustellen, dass die erbrachte Prüfungsleistung dem/der Studierenden zurechenbar ist. Die wesentlichen Gegenstände und Ergebnisse einer solchen Erfolgskontrolle sind in einem Protokoll festzuhalten.

Bei *mündlich* durchgeführten *Prüfungsleistungen anderer Art* muss neben der/dem Prüfenden ein/e Beisitzende/r anwesend sein, die/der zusätzlich zum/zur Prüfenden das Protokoll zeichnet.

Schriftliche Arbeiten im Rahmen einer *Prüfungsleistung anderer Art* haben dabei die folgende Erklärung zu tragen: „Ich versichere wahrheitsgemäß, die Arbeit selbstständig angefertigt, alle benutzten Hilfsmittel vollständig und genau angegeben und alles kenntlich gemacht zu haben, was aus Arbeiten anderer unverändert oder mit Abänderungen entnommen wurde.“ Trägt die Arbeit diese Erklärung nicht, wird sie nicht angenommen. Die wesentlichen Gegenstände und Ergebnisse der Erfolgskontrolle sind in einem Protokoll festzuhalten.

§ 6 a Erfolgskontrollen im Antwort-Wahl-Verfahren

Das Modulhandbuch regelt, ob und in welchem Umfang Erfolgskontrollen im Wege des *Antwort-Wahl-Verfahrens* abgelegt werden können.

§ 6 b Computergestützte Erfolgskontrollen

(1) Erfolgskontrollen können computergestützt durchgeführt werden. Dabei wird die Antwort bzw. Lösung der/des Studierenden elektronisch übermittelt und, sofern möglich, automatisiert ausgewertet. Die Prüfungsinhalte sind von einer/einem Prüfenden zu erstellen.

(2) Vor der computergestützten Erfolgskontrolle hat die/der Prüfende sicherzustellen, dass die elektronischen Daten eindeutig identifiziert und unverwechselbar und dauerhaft den Studierenden zugeordnet werden können. Der störungsfreie Verlauf einer computergestützten Erfolgskontrolle ist durch entsprechende technische und fachliche Betreuung zu gewährleisten. Alle Prüfungsaufgaben müssen während der gesamten Bearbeitungszeit zur Bearbeitung zur Verfügung stehen.

(3) Im Übrigen gelten für die Durchführung von computergestützten Erfolgskontrollen die §§ 6 bzw. 6 a.

§ 7 Bewertung von Studien- und Prüfungsleistungen

(1) Das Ergebnis einer Prüfungsleistung wird von den jeweiligen Prüfenden in Form einer Note festgesetzt.

(2) Folgende Noten sollen verwendet werden:

sehr gut (very good)	:	hervorragende Leistung,
gut (good)	:	eine Leistung, die erheblich über den durchschnittlichen Anforderungen liegt,
befriedigend (satisfactory)	:	eine Leistung, die durchschnittlichen Anforderungen entspricht,
ausreichend (sufficient)	:	eine Leistung, die trotz ihrer Mängel noch den Anforderungen genügt,
nicht ausreichend (failed)	:	eine Leistung, die wegen erheblicher Mängel nicht den Anforderungen genügt.

Zur differenzierten Bewertung einzelner Prüfungsleistungen sind nur folgende Noten zugelassen:

1,0; 1,3	:	sehr gut
1,7; 2,0; 2,3	:	gut
2,7; 3,0; 3.3	:	befriedigend
3,7; 4,0	:	ausreichend
5,0	:	nicht ausreichend

(3) Studienleistungen werden mit „bestanden“ oder mit „nicht bestanden“ gewertet.

(4) Bei der Bildung der gewichteten Durchschnitte der Modulnoten, der Fachnoten und der Gesamtnote wird nur die erste Dezimalstelle hinter dem Komma berücksichtigt; alle weiteren Stellen werden ohne Rundung gestrichen.

(5) Jedes Modul und jede Erfolgskontrolle darf in demselben Studiengang nur einmal gewertet werden.

(6) Eine Prüfungsleistung ist bestanden, wenn die Note mindestens „ausreichend“ (4,0) ist.

(7) Die Modulprüfung ist bestanden, wenn alle erforderlichen Erfolgskontrollen bestanden sind. Die Modulprüfung und die Bildung der Modulnote sollen im Modulhandbuch geregelt werden. Sofern das Modulhandbuch keine Regelung über die Bildung der Modulnote enthält, errechnet sich die Modulnote aus einem nach den Leistungspunkten der einzelnen Teilmodule gewichteter Notendurchschnitt. Die differenzierten Noten (Absatz 2) sind bei der Berechnung der Modulnoten als Ausgangsdaten zu verwenden.

(8) Die Ergebnisse der Erfolgskontrollen sowie die erworbenen Leistungspunkte werden durch den Studierendenservice des KIT verwaltet.

(9) Die Noten der Module eines Faches gehen in die Fachnote mit einem Gewicht proportional zu den ausgewiesenen Leistungspunkten der Module ein.

(10) Die Gesamtnote der Bachelorprüfung, die Fachnoten und die Modulnoten lauten:

		bis	1,5	=	sehr gut
von	1,6	bis	2,5	=	gut
von	2,6	bis	3,5	=	befriedigend
von	3,6	bis	4,0	=	ausreichend

§ 8 Orientierungsprüfungen, Verlust des Prüfungsanspruchs

(1) Die Teilmodulprüfung „Höhere Mathematik I“ im Modul „Höhere Mathematik“, die Teilmodulprüfung „Technische Mechanik I“ im Modul „Technische Mechanik“ und die Modulprüfung im Modul „Digitaltechnik“ sind bis zum Ende des Prüfungszeitraums des zweiten Fachsemesters abzulegen (Orientierungsprüfungen).

(2) Wer die Orientierungsprüfungen einschließlich etwaiger Wiederholungen bis zum Ende des Prüfungszeitraums des dritten Fachsemesters nicht erfolgreich abgelegt hat, verliert den Prüfungsanspruch im Studiengang, es sei denn, dass die Fristüberschreitung nicht selbst zu vertreten ist; hierüber entscheidet der Prüfungsausschuss auf Antrag der oder des Studierenden. Eine zweite Wiederholung der Orientierungsprüfungen ist ausgeschlossen. Die Fristüberschreitung hat die/der Studierende insbesondere dann nicht zu vertreten, wenn eine qualifizierte Teilnahme am MINT-Kolleg im Sinne von § 3 Abs. 2 vorliegt. Ohne ausdrückliche Genehmigung des Vorsitzenden des Prüfungsausschusses gilt eine Fristüberschreitung von

1. einem Semester als genehmigt, wenn die/der Studierende eine qualifizierte Teilnahme am MINT-Kolleg gemäß § 3 Abs. 2 im Umfang von einem Semester nachweist oder
2. zwei Semestern als genehmigt, wenn die/der Studierende eine qualifizierte Teilnahme am MINT-Kolleg gemäß § 3 Abs. 2 im Umfang von zwei Semestern nachweist.

Als Nachweis gilt die vom MINT-Kolleg gemäß § 3 Abs. 2 auszustellende Bescheinigung, die beim Studierendenservice des KIT einzureichen ist. Im Falle von Nr. 1 kann der Vorsitzende des Prüfungsausschusses auf Antrag der Studierenden die Frist um ein weiteres Semester verlängern, wenn dies aus studienorganisatorischen Gründen für das fristgerechte Ablegen der Orientierungsprüfung erforderlich ist, insbesondere weil die Module, die Bestandteil der Orientierungsprüfung sind, nur einmal jährlich angeboten werden.

(3) Ist die Bachelorprüfung bis zum Ende des Prüfungszeitraums des zehnten Fachsemesters einschließlich etwaiger Wiederholungen nicht vollständig abgelegt, so erlischt der Prüfungsanspruch im Studiengang Mechatronik und Informationstechnik, es sei denn, dass die Fristüberschreitung nicht selbst zu vertreten ist. Die Entscheidung über eine Fristverlängerung und über Ausnahmen von der Fristregelung trifft der Prüfungsausschuss unter Beachtung der in § 32 Abs. 6 LHG genannten Tätigkeiten auf Antrag des/der Studierenden. Der Antrag ist schriftlich in der Regel bis sechs Wochen vor Ablauf der in Satz 1 genannten Studienhöchstdauer zu stellen. Absatz 2 Satz 3 bis 5 gelten entsprechend.

(4) Der Prüfungsanspruch geht auch verloren, wenn eine nach dieser Studien- und Prüfungsordnung erforderliche Studien- oder Prüfungsleistung endgültig nicht bestanden ist oder eine Wiederholungsprüfung nach § 9 Abs. 6 nicht rechtzeitig erbracht wurde, es sei denn die Fristüberschreitung ist nicht selbst zu vertreten.

§ 9 Wiederholung von Erfolgskontrollen, endgültiges Nichtbestehen

(1) Studierende können eine nicht bestandene schriftliche Prüfung (§ 4 Absatz 2 Nr. 1) einmal wiederholen. Wird eine schriftliche Wiederholungsprüfung mit „nicht ausreichend“ (5,0) bewertet, so findet eine mündliche Nachprüfung im zeitlichen Zusammenhang mit dem Termin der nicht bestandenen Prüfung statt. In diesem Falle kann die Note dieser Prüfung nicht besser als „ausreichend“ (4,0) sein.

(2) Studierende können eine nicht bestandene mündliche Prüfung (§ 4 Absatz 2 Nr. 2) einmal wiederholen.

(3) Wiederholungsprüfungen nach Absatz 1 und 2 müssen in Inhalt, Umfang und Form (mündlich oder schriftlich) der ersten entsprechen. Ausnahmen kann der zuständige Prüfungsausschuss auf Antrag zulassen.

(4) Prüfungsleistungen anderer Art (§ 4 Absatz 2 Nr. 3) können einmal wiederholt werden.

(5) Studienleistungen können mehrfach wiederholt werden.

(6) Die Wiederholung von Prüfungsleistungen hat spätestens bis zum Ende des Prüfungszeitraumes des übernächsten Semesters zu erfolgen.

(7) Die Prüfungsleistung ist endgültig nicht bestanden, wenn die mündliche Nachprüfung im Sinne des Absatzes 1 mit „nicht ausreichend“ (5,0) bewertet wurde. Die Prüfungsleistung ist ferner endgültig nicht bestanden, wenn die mündliche Prüfung im Sinne des Absatzes 2 oder die Prüfungsleistung anderer Art gemäß Absatz 4 zweimal mit „nicht bestanden“ bewertet wurde.

(8) Das Modul ist endgültig nicht bestanden, wenn eine für sein Bestehen erforderliche Prüfungsleistung endgültig nicht bestanden ist.

(9) Eine zweite Wiederholung derselben Prüfungsleistung gemäß § 4 Abs. 2 ist nur in Ausnahmefällen auf Antrag des/der Studierenden zulässig („Antrag auf Zweitwiederholung“). Der Antrag ist schriftlich beim Prüfungsausschuss in der Regel bis zwei Monate nach Bekanntgabe der Note zu stellen.

Über den ersten Antrag eines/einer Studierenden auf Zweitwiederholung entscheidet der Prüfungsausschuss, wenn er den Antrag genehmigt. Wenn der Prüfungsausschuss diesen Antrag ablehnt, entscheidet ein Mitglied des Präsidiums. Über weitere Anträge auf Zweitwiederholung entscheidet nach Stellungnahme des Prüfungsausschusses ein Mitglied des Präsidiums. Wird der Antrag genehmigt, hat die Zweitwiederholung spätestens zum übernächsten Prüfungstermin zu erfolgen. Absatz 1 Satz 2 und 3 gelten entsprechend.

(10) Die Wiederholung einer bestandenen Prüfungsleistung ist nicht zulässig.

(11) Die Bachelorarbeit kann bei einer Bewertung mit „nicht ausreichend“ (5,0) einmal wiederholt werden. Eine zweite Wiederholung der Bachelorarbeit ist ausgeschlossen.

§ 10 Abmeldung; Versäumnis, Rücktritt

(1) Studierende können ihre Anmeldung zu *schriftlichen Prüfungen* ohne Angabe von Gründen bis zur Ausgabe der Prüfungsaufgaben widerrufen (Abmeldung). Eine Abmeldung kann online im Studierendenportal bis 24:00 Uhr des Vortages der Prüfung oder in begründeten Ausnahmefällen beim Studierendenservice innerhalb der Geschäftszeiten erfolgen. Erfolgt die Abmeldung gegenüber dem/der Prüfenden, hat diese/r Sorge zu tragen, dass die Abmeldung im Campus Management System verbucht wird.

(2) Bei *mündlichen Prüfungen* muss die Abmeldung spätestens drei Werktage vor dem betreffenden Prüfungstermin gegenüber dem/der Prüfenden erklärt werden. Der Rücktritt von einer mündlichen Prüfung weniger als drei Werktage vor dem betreffenden Prüfungstermin ist nur unter den Voraussetzungen des Absatzes 5 möglich. Der Rücktritt von mündlichen Nachprüfungen im Sinne von § 9 Abs. 1 ist grundsätzlich nur unter den Voraussetzungen von Absatz 5 möglich.

(3) Die Abmeldung von *Prüfungsleistungen anderer Art* sowie von *Studienleistungen* ist im Modulhandbuch geregelt.

(4) Eine Erfolgskontrolle gilt als mit „nicht ausreichend" (5,0) bewertet, wenn die Studierenden einen Prüfungstermin ohne triftigen Grund versäumen oder wenn sie nach Beginn der Erfolgskontrolle ohne triftigen Grund von dieser zurücktreten. Dasselbe gilt, wenn die Bachelorarbeit nicht innerhalb der vorgesehenen Bearbeitungszeit erbracht wird, es sei denn, der/die Studierende hat die Fristüberschreitung nicht zu vertreten.

(5) Der für den Rücktritt nach Beginn der Erfolgskontrolle oder das Versäumnis geltend gemachte Grund muss dem Prüfungsausschuss unverzüglich schriftlich angezeigt und glaubhaft gemacht werden. Bei Krankheit des/der Studierenden oder eines allein zu versorgenden Kindes oder pflegebedürftigen Angehörigen kann die Vorlage eines ärztlichen Attestes verlangt werden.

§ 11 Täuschung, Ordnungsverstoß

(1) Versuchen Studierende das Ergebnis ihrer Erfolgskontrolle durch Täuschung oder Benutzung nicht zugelassener Hilfsmittel zu beeinflussen, gilt die betreffende Erfolgskontrolle als mit „nicht ausreichend" (5,0) bewertet.

(2) Studierende, die den ordnungsgemäßen Ablauf einer Erfolgskontrolle stören, können von der/dem Prüfenden oder der Aufsicht führenden Person von der Fortsetzung der Erfolgskontrolle ausgeschlossen werden. In diesem Fall gilt die betreffende Erfolgskontrolle als mit „nicht ausreichend" (5,0) bewertet. In schwerwiegenden Fällen kann der Prüfungsausschuss diese Studierenden von der Erbringung weiterer Erfolgskontrollen ausschließen.

(3) Näheres regelt die Allgemeine Satzung des KIT zur Redlichkeit bei Prüfungen und Praktika in der jeweils gültigen Fassung.

§ 12 Mutterschutz, Elternzeit, Wahrnehmung von Familienpflichten

(1) Auf Antrag sind die Mutterschutzfristen, wie sie im jeweils gültigen Gesetz zum Schutz der erwerbstätigen Mutter (Mutterschutzgesetz - MuSchG) festgelegt sind, entsprechend zu berücksichtigen. Dem Antrag sind die erforderlichen Nachweise beizufügen. Die Mutterschutzfristen unterbrechen jede Frist nach dieser Prüfungsordnung. Die Dauer des Mutterschutzes wird nicht in die Frist eingerechnet.

(2) Gleichfalls sind die Fristen der Elternzeit nach Maßgabe des jeweils gültigen Gesetzes (Bundeselterngeld- und Elternzeitgesetz - BEEG) auf Antrag zu berücksichtigen. Der/die Studierende muss bis spätestens vier Wochen vor dem Zeitpunkt, von dem an die Elternzeit angetreten werden soll, dem Prüfungsausschuss, unter Beifügung der erforderlichen Nachweise schriftlich mitteilen, in welchem Zeitraum die Elternzeit in Anspruch genommen werden soll. Der Prüfungsausschuss hat zu prüfen, ob die gesetzlichen Voraussetzungen vorliegen, die bei einer Arbeitnehmerin bzw. einem Arbeitnehmer den Anspruch auf Elternzeit auslösen würden, und teilt dem/der Studierenden das Ergebnis sowie die neu festgesetzten Prüfungszeiten unverzüglich mit. Die Bearbeitungszeit der Bachelorarbeit kann nicht durch Elternzeit unterbrochen werden. Die gestellte Arbeit gilt als nicht vergeben. Nach Ablauf der Elternzeit erhält der/die Studierende ein neues Thema, das innerhalb der in § 14 festgelegten Bearbeitungszeit zu bearbeiten ist.

(3) Der Prüfungsausschuss entscheidet auf Antrag über die flexible Handhabung von Prüfungsfristen entsprechend den Bestimmungen des Landeshochschulgesetzes, wenn Studierende Familienpflichten wahrzunehmen haben. Absatz 2 Satz 4 bis 6 gelten entsprechend.

§ 13 Studierende mit Behinderung oder chronischer Erkrankung

(1) Bei der Gestaltung und Organisation des Studiums sowie der Prüfungen sind die Belange Studierender mit Behinderung oder chronischer Erkrankung zu berücksichtigen. Insbesondere ist Studierenden mit Behinderung oder chronischer Erkrankung bevorzugter Zugang zu teilnahmebegrenzten Lehrveranstaltungen zu gewähren und die Reihenfolge für das Absolvieren bestimmter Lehrveranstaltungen entsprechend ihrer Bedürfnisse anzupassen. Studierende sind gemäß Bundesgleichstellungsgesetz (BGG) und Sozialgesetzbuch Neuntes Buch (SGB IX) behindert, wenn ihre körperliche Funktion, geistige Fähigkeit oder seelische Gesundheit mit hoher Wahrscheinlichkeit länger als sechs Monate von dem für das Lebensalter typischen Zustand abweichen und daher ihre Teilhabe am Leben in der Gesellschaft beeinträchtigt ist. Der Prüfungsausschuss entscheidet auf Antrag der/des Studierenden über das Vorliegen der Voraussetzungen nach Satz 2 und 3. Die/der Studierende hat die entsprechenden Nachweise vorzulegen.

(2) Weisen Studierende eine Behinderung oder chronische Erkrankung nach und folgt daraus, dass sie nicht in der Lage sind, Erfolgskontrollen ganz oder teilweise in der vorgeschriebenen Zeit oder Form abzulegen, kann der Prüfungsausschuss gestatten, die Erfolgskontrollen in einem anderen Zeitraum oder einer anderen Form zu erbringen. Insbesondere ist behinderten Studierenden zu gestatten, notwendige Hilfsmittel zu benutzen.

(3) Weisen Studierende eine Behinderung oder chronische Erkrankung nach und folgt daraus, dass sie nicht in der Lage sind, die Lehrveranstaltungen regelmäßig zu besuchen oder die gemäß § 20 erforderlichen Studien- und Prüfungsleistungen zu erbringen, kann der Prüfungsausschuss auf Antrag gestatten, dass einzelne Studien- und Prüfungsleistungen nach Ablauf der in dieser Studien- und Prüfungsordnung vorgesehenen Fristen absolviert werden können.

§ 14 Modul Bachelorarbeit

(1) Voraussetzung für die Zulassung zum Modul Bachelorarbeit ist, dass die/der Studierende Modulprüfungen im Umfang von 120 LP erfolgreich abgelegt hat. Über Ausnahmen entscheidet der Prüfungsausschuss auf Antrag der/des Studierenden.

(1 a) Dem Modul Bachelorarbeit sind 12 LP zugeordnet. Es besteht aus der Bachelorarbeit und einer Präsentation. Die Präsentation hat innerhalb der maximalen Bearbeitungsdauer gemäß Absatz 4 Satz 2, jedoch spätestens sechs Wochen nach Abgabe der Bachelorarbeit zu erfolgen.

(2) Die Bachelorarbeit kann von Hochschullehrer/innen und leitenden Wissenschaftler/innen gemäß § 14 Abs. 3 Ziff. 1 KITG vergeben werden. Darüber hinaus kann der Prüfungsausschuss weitere Prüfende gemäß § 18 Abs. 2 und 3 zur Vergabe des Themas berechtigen. Den Studierenden ist Gelegenheit zu geben, für das Thema Vorschläge zu machen. Soll die Bachelorarbeit außerhalb der nach § 1 Satz 2 beteiligten KIT-Fakultäten angefertigt werden, so bedarf dies der Genehmigung durch den Prüfungsausschuss. Die Bachelorarbeit kann auch in Form einer Gruppenarbeit zugelassen werden, wenn der als Prüfungsleistung zu bewertende Beitrag der einzelnen Studierenden aufgrund objektiver Kriterien, die eine eindeutige Abgrenzung ermöglichen, deutlich unterscheidbar ist und die Anforderung nach Absatz 4 erfüllt. In Ausnahmefällen sorgt die/der Vorsitzende des Prüfungsausschusses auf Antrag der oder des Studierenden dafür, dass die/der Studierende innerhalb von vier Wochen ein Thema für die Bachelorarbeit erhält.

Die Ausgabe des Themas erfolgt in diesem Fall über die/den Vorsitzende/n des Prüfungsausschusses.

(3) Thema, Aufgabenstellung und Umfang der Bachelorarbeit sind von dem Betreuer bzw. der Betreuerin so zu begrenzen, dass sie mit dem in Absatz 4 festgelegten Arbeitsaufwand bearbeitet werden kann.

(4) Die Bachelorarbeit soll zeigen, dass die Studierenden in der Lage sind, ein Problem aus ihrem Studienfach selbstständig und in begrenzter Zeit nach wissenschaftlichen Methoden zu bearbeiten. Die maximale Bearbeitungsdauer beträgt sechs Monate. Thema und Aufgabenstellung sind an den vorgesehenen Umfang anzupassen. Der Prüfungsausschuss legt fest, in welchen Sprachen die Bachelorarbeit geschrieben werden kann. Auf Antrag des Studierenden kann der/die Prüfende genehmigen, dass die Bachelorarbeit in einer anderen Sprache als Deutsch geschrieben wird.

(5) Bei der Abgabe der Bachelorarbeit haben die Studierenden schriftlich zu versichern, dass sie die Arbeit selbstständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt haben, die wörtlich oder inhaltlich übernommenen Stellen als solche kenntlich gemacht und die Satzung des KIT zur Sicherung guter wissenschaftlicher Praxis in der jeweils gültigen Fassung beachtet haben. Wenn diese Erklärung nicht enthalten ist, wird die Arbeit nicht angenommen. Die Erklärung kann wie folgt lauten: „Ich versichere wahrheitsgemäß, die Arbeit selbstständig verfasst, alle benutzten Hilfsmittel vollständig und genau angegeben und alles kenntlich gemacht zu haben, was aus Arbeiten anderer unverändert oder mit Abänderungen entnommen wurde sowie die Satzung des KIT zur Sicherung guter wissenschaftlicher Praxis in der jeweils gültigen Fassung beachtet zu haben." Bei Abgabe einer unwahren Versicherung wird die Bachelorarbeit mit „nicht ausreichend" (5,0) bewertet.

(6) Der Zeitpunkt der Ausgabe des Themas der Bachelorarbeit ist durch die Betreuerin/den Betreuer und die/den Studierenden festzuhalten und dies beim Prüfungsausschuss aktenkundig zu machen. Der Zeitpunkt der Abgabe der Bachelorarbeit ist durch den/die Prüfende/n beim Prüfungsausschuss aktenkundig zu machen. Das Thema kann nur einmal und nur innerhalb des ersten Monats der Bearbeitungszeit zurückgegeben werden. Macht der oder die Studierende einen triftigen Grund geltend, kann der Prüfungsausschuss die in Absatz 4 festgelegte Bearbeitungszeit auf Antrag der oder des Studierenden um höchstens einen Monat verlängern. Wird die Bachelorarbeit nicht fristgerecht abgeliefert, gilt sie als mit „nicht ausreichend" (5,0) bewertet, es sei denn, dass die Studierenden dieses Versäumnis nicht zu vertreten haben.

(7) Die Bachelorarbeit wird von mindestens einem/einer Hochschullehrer/in, einem habilitierten Mitglied der gemäß § 1 Satz 2 beteiligten KIT-Fakultäten oder einem/einer leitenden Wissenschaftler/in gemäß § 14 Abs. 3 Ziff. 1 KITG und einem/einer weiteren Prüfenden bewertet. In der Regel ist eine/r der Prüfenden die Person, die die Arbeit gemäß Absatz 2 vergeben hat. Bei nicht übereinstimmender Beurteilung dieser beiden Personen setzt der Prüfungsausschuss im Rahmen der Bewertung dieser beiden Personen die Note der Bachelorarbeit fest; er kann auch einen weiteren Gutachter bestellen. Die Bewertung hat innerhalb von sechs Wochen nach Abgabe der Bachelorarbeit zu erfolgen.

§ 14 a Berufspraktikum

(1) Während des Bachelorstudiums ist ein mindestens dreizehnwöchiges Berufspraktikum abzuleisten, welches geeignet ist, den Studierenden eine Anschauung von berufspraktischer Tätigkeit auf dem Gebiet der Mechatronik und Informationstechnik zu vermitteln. Dem Berufspraktikum sind 15 Leistungspunkte zugeordnet.

(2) Die Studierenden setzen sich in eigener Verantwortung mit geeigneten privaten oder öffentlichen Einrichtungen in Verbindung, an denen das Praktikum abgeleistet werden kann. Das Nähere regelt das Modulhandbuch.

§ 15 Zusatzleistungen

(1) Es können auch weitere Leistungspunkte (Zusatzleistungen) im Umfang von höchstens 30 LP aus dem Gesamtangebot des KIT erworben werden. § 3 und § 4 der Prüfungsordnung bleiben davon unberührt. Diese Zusatzleistungen gehen nicht in die Festsetzung der Gesamt- und Modulnoten ein. Die bei der Festlegung der Modulnote nicht berücksichtigten LP werden als Zusatzleistungen im Transcript of Records aufgeführt und als Zusatzleistungen gekennzeichnet. Auf Antrag der/des Studierenden werden die Zusatzleistungen in das Bachelorzeugnis aufgenommen und als Zusatzleistungen gekennzeichnet. Zusatzleistungen werden mit den nach § 7 vorgesehenen Noten gelistet.

(2) Die Studierenden haben bereits bei der Anmeldung zu einer Prüfung in einem Modul diese als Zusatzleistung zu deklarieren.

§ 15 a Mastervorzug

Studierende, die im Bachelorstudium bereits mindestens 120 LP erworben haben, können zusätzlich zu den in § 15 Abs. 1 genannten Zusatzleistungen Leistungspunkte aus einem konsekutiven Masterstudiengang am KIT im Umfang von höchstens 30 LP erwerben (Mastervorzugsleistungen). § 3 und § 4 der Prüfungsordnung bleiben davon unberührt. Die Mastervorzugsleistungen gehen nicht in die Festsetzung der Gesamt-, Fach- und Modulnoten ein. Sie werden im Transcript of Records aufgeführt und als solche gekennzeichnet sowie mit den nach § 7 vorgesehenen Noten gelistet. § 15 Absatz 2 gilt entsprechend.

§ 16 Überfachliche Qualifikationen

Neben der Vermittlung von fachlichen Qualifikationen ist der Auf- und Ausbau überfachlicher Qualifikationen im Umfang von mindestens 6 LP Bestandteil eines Bachelorstudiums. Überfachliche Qualifikationen können additiv oder integrativ vermittelt werden.

§ 17 Prüfungsausschuss

(1) Für den Bachelorstudiengang Mechatronik und Informationstechnik wird ein Prüfungsausschuss gebildet. Er besteht aus vier stimmberechtigten Mitgliedern: zwei Hochschullehrer/innen / leitenden Wissenschaftler/innen gemäß § 14 Abs. 3 Ziff. 1 KITG / Privatdozentinnen bzw. -dozenten, zwei akademischen Mitarbeiterinnen und Mitarbeitern nach § 52 LHG / wissenschaftlichen Mitarbeiter/innen gemäß § 14 Abs. 3 Ziff. 2 KITG aus den nach § 1 Satz 2 beteiligten KIT-Fakultäten und zwei Studierenden mit beratender Stimme. Im Falle der Einrichtung eines gemeinsamen Prüfungsausschusses für den Bachelor- und den Masterstudiengang Mechatronik und Informationstechnikerhöht sich die Anzahl der Studierenden auf vier Mitglieder mit beratender Stimme, wobei je zwei dieser vier aus dem Bachelor- und aus dem Masterstudiengang stammen. Die Amtszeit der nichtstudentischen Mitglieder beträgt zwei Jahre, die des studentischen Mitglieds ein Jahr. Jede gemäß § 1 Satz 2 beteiligte KIT-Fakultät muss stimmberechtigt vertreten sein.

(2) Die/der Vorsitzende, ihre/sein Stellvertreter/in, die weiteren Mitglieder des Prüfungsausschusses sowie deren Stellvertreter/innen werden von den KIT-Fakultätsräten der gemäß § 1 Satz 2 beteiligten KIT-Fakultäten bestellt, die akademischen Mitarbeiter/innen nach § 52 LHG, die wissenschaftlichen Mitarbeiter gemäß § 14 Abs. 3 Ziff. 2 KITG und die Studierenden auf Vorschlag der Mitglieder der jeweiligen Gruppe; Wiederbestellung ist möglich. Die/der Vorsitzende und deren/dessen Stellvertreter/in müssen Hochschullehrer/innen oder leitende Wissenschaftler/innen § 14 Abs. 3 Ziff. 1 KITG sein. Die/der Vorsitzende des Prüfungsausschusses nimmt die laufenden Geschäfte wahr und wird durch das jeweilige Prüfungssekretariat unterstützt.

(3) Der Prüfungsausschuss achtet auf die Einhaltung der Bestimmungen dieser Studien- und Prüfungsordnung sowie deren Umsetzung in den gemäß § 1 Satz 2 beteiligten KIT-Fakultäten und fällt die Entscheidungen in Prüfungsangelegenheiten. Er entscheidet über die Anerkennung von Studienzeiten sowie Studien- und Prüfungsleistungen und trifft die Feststellung gemäß § 19 Absatz 1 Satz 1. Er berichtet der den gemäß § 1 Satz 2 beteiligten KIT-Fakultäten regelmäßig über die Entwicklung der Prüfungs- und Studienzeiten, einschließlich der Bearbeitungszeiten für die Bachelorarbeiten und die Verteilung der Modul- und Gesamtnoten. Er ist zuständig für Anregungen zur Reform der Studien- und Prüfungsordnung und zu Modulbeschreibungen. Der Prüfungsausschuss entscheidet mit der Mehrheit seiner Stimmen. Bei Stimmengleichheit entscheidet der Vorsitzende des Prüfungsausschusses.

(4) Der Prüfungsausschuss kann die Erledigung seiner Aufgaben für alle Regelfälle auf die/den Vorsitzende/n des Prüfungsausschusses übertragen. In dringenden Angelegenheiten, deren Erledigung nicht bis zu der nächsten Sitzung des Prüfungsausschusses warten kann, entscheidet die/der Vorsitzende des Prüfungsausschusses.

(5) Die Mitglieder des Prüfungsausschusses haben das Recht, der Abnahme von Prüfungen beizuwohnen. Die Mitglieder des Prüfungsausschusses, die Prüfenden und die Beisitzenden unterliegen der Verschwiegenheit. Sofern sie nicht im öffentlichen Dienst stehen, sind sie durch die/den Vorsitzende/n zur Verschwiegenheit zu verpflichten.

(6) In Angelegenheiten des Prüfungsausschusses, die eine an einer anderen KIT-Fakultät zu absolvierende Prüfungsleistung betreffen, ist auf Antrag eines Mitgliedes des Prüfungsausschusses eine fachlich zuständige und von der betroffenen KIT-Fakultät zu nennende prüfungsberechtigte Person hinzuzuziehen.

(7) Belastende Entscheidungen des Prüfungsausschusses sind schriftlich mitzuteilen. Sie sind zu begründen und mit einer Rechtsbehelfsbelehrung zu versehen. Vor einer Entscheidung ist Gelegenheit zur Äußerung zu geben. Widersprüche gegen Entscheidungen des Prüfungsausschusses sind innerhalb eines Monats nach Zugang der Entscheidung schriftlich oder zur Niederschrift bei diesem einzulegen. Über Widersprüche entscheidet das für Lehre zuständig Mitglied des Präsidiums.

§ 18 Prüfende und Beisitzende

(1) Der Prüfungsausschuss bestellt die Prüfenden. Er kann die Bestellung der/dem Vorsitzenden übertragen.

(2) Prüfende sind Hochschullehr/innen sowie leitende Wissenschaftler/innen gemäß § 14 Abs. 3 Ziff. 1 KITG, habilitierte Mitglieder und akademische Mitarbeiter/innen gemäß § 52 LHG, welche einer der gemäß § 1 Satz 2 beteiligten KIT-Fakultäten angehören und denen die Prüfungsbefugnis übertragen wurde; desgleichen kann wissenschaftlichen Mitarbeitern gemäß § 14 Abs. 3 Ziff. 2 KITG die Prüfungsbefugnis übertragen werden. Bestellt werden darf nur, wer mindestens die dem jeweiligen Prüfungsgegenstand entsprechende fachwissenschaftliche Qualifikation erworben hat.

(3) Soweit Lehrveranstaltungen von anderen als den unter Absatz 2 genannten Personen durchgeführt werden, sollen diese zu Prüfenden bestellt werden, sofern eine der gemäß § 1 Satz 2 beteiligten KIT-Fakultäten eine Prüfungsbefugnis erteilt hat und sie die gemäß Absatz 2 Satz 2 vorausgesetzte Qualifikation nachweisen können.

(4) Die Beisitzenden werden durch die Prüfenden benannt. Zu Beisitzenden darf nur bestellt werden, wer einen akademischen Abschluss in einem mathematisch-naturwissenschaftlichen oder ingenieurwissenschaftlichen Studiengang oder einen gleichwertigen akademischen Abschluss erworben hat.

§ 19 Anerkennung von Studien- und Prüfungsleistungen, Studienzeiten

(1) Studien- und Prüfungsleistungen sowie Studienzeiten, die in Studiengängen an staatlichen oder staatlich anerkannten Hochschulen und Berufsakademien der Bundesrepublik Deutschland oder an ausländischen staatlichen oder staatlich anerkannten Hochschulen erbracht wurden, werden auf Antrag der Studierenden anerkannt, sofern hinsichtlich der erworbenen Kompetenzen kein wesentlicher Unterschied zu den Leistungen oder Abschlüssen besteht, die ersetzt werden sollen. Dabei ist kein schematischer Vergleich, sondern eine Gesamtbetrachtung vorzunehmen. Bezüglich des Umfangs einer zur Anerkennung vorgelegten Studien- bzw. Prüfungsleistung (Anrechnung) werden die Grundsätze des ECTS herangezogen.

(2) Die Studierenden haben die für die Anerkennung erforderlichen Unterlagen vorzulegen. Studierende, die neu in den Studiengang Mechatronik und Informationstechnik immatrikuliert wurden, haben den Antrag mit den für die Anerkennung erforderlichen Unterlagen innerhalb eines Semesters nach Immatrikulation zu stellen. Bei Unterlagen, die nicht in deutscher oder englischer Sprache vorliegen, kann eine amtlich beglaubigte Übersetzung verlangt werden. Die Beweislast dafür, dass der Antrag die Voraussetzungen für die Anerkennung nicht erfüllt, liegt beim Prüfungsausschuss.

(3) Werden Leistungen angerechnet, die nicht am KIT erbracht wurden, werden sie im Zeugnis als „anerkannt" ausgewiesen. Liegen Noten vor, werden die Noten, soweit die Notensysteme vergleichbar sind, übernommen und in die Berechnung der Modulnoten und der Gesamtnote einbezogen. Sind die Notensysteme nicht vergleichbar, können die Noten umgerechnet werden. Liegen keine Noten vor, wird der Vermerk „bestanden" aufgenommen.

(4) Bei der Anerkennung von Studien- und Prüfungsleistungen, die außerhalb der Bundesrepublik Deutschland erbracht wurden, sind die von der Kultusministerkonferenz und der Hochschulrektorenkonferenz gebilligten Äquivalenzvereinbarungen sowie Absprachen im Rahmen der Hochschulpartnerschaften zu beachten.

(5) Außerhalb des Hochschulsystems erworbene Kenntnisse und Fähigkeiten werden angerechnet, wenn sie nach Inhalt und Niveau den Studien- und Prüfungsleistungen gleichwertig sind, die ersetzt werden sollen und die Institution, in der die Kenntnisse und Fähigkeiten erworben wurden, ein genormtes Qualitätssicherungssystem hat. Die Anrechnung kann in Teilen versagt werden, wenn mehr als 50 Prozent des Hochschulstudiums ersetzt werden soll.

(6) Zuständig für Anerkennung und Anrechnung ist der Prüfungsausschuss. Im Rahmen der Feststellung, ob ein wesentlicher Unterschied im Sinne des Absatz 1 vorliegt, sind die zuständigen Fachvertreter/innen zu hören. Der Prüfungsausschuss entscheidet in Abhängigkeit von Art und Umfang der anzurechnenden Studien- und Prüfungsleistungen über die Einstufung in ein höheres Fachsemester.

II. Bachelorprüfung

§ 20 Umfang und Art der Bachelorprüfung

(1) Die Bachelorprüfung besteht aus den Modulprüfungen nach Absatz 2 sowie dem Modul Bachelorarbeit (§ 14) und dem Berufspraktikum (§ 14 a).

(2) Es sind Modulprüfungen in folgenden Pflichtfächern abzulegen:

1. Ingenieurwissenschaftliche Grundlagen: Modul(e) im Umfang von 110 LP,
2. Vertiefung in der Mechatronik: Modul(e) im Umfang von 37 LP,
3. Überfachliche Qualifikationen im Umfang von 6 LP gemäß § 16.

Die Festlegung der zur Auswahl stehenden Module und deren Fachzuordnung werden im Modulhandbuch getroffen.

§ 20 a Leistungsnachweise für die Bachelorprüfung

Voraussetzung für die Anmeldung zur letzten Modulprüfung der Bachelorprüfung ist die Bescheinigung über das erfolgreich abgeleistete Berufspraktikum nach § 14 a. In Ausnahmefällen, die die Studierenden nicht zu vertreten haben, kann der Prüfungsausschuss die nachträgliche Vorlage dieses Leistungsnachweises genehmigen.

§ 21 Bestehen der Bachelorprüfung, Bildung der Gesamtnote

(1) Die Bachelorprüfung ist bestanden, wenn alle in § 20 genannten Modulprüfungen mindestens mit „ausreichend“ bewertet wurden.

(2) Die Gesamtnote der Bachelorprüfung errechnet sich als ein mit Leistungspunkten gewichteter Notendurchschnitt der Fachnoten sowie des Moduls Bachelorarbeit.

(3) Haben Studierende die Bachelorarbeit mit der Note 1,0 und die Bachelorprüfung mit einem Durchschnitt von 1,2 oder besser abgeschlossen, so wird das Prädikat „mit Auszeichnung“ (with distinction) verliehen.

§ 22 Bachelorzeugnis, Bachelorurkunde, Diploma Supplement und Transcript of Records

(1) Über die Bachelorprüfung werden nach Bewertung der letzten Prüfungsleistung eine Bachelorurkunde und ein Zeugnis erstellt. Die Ausfertigung von Bachelorurkunde und Zeugnis soll nicht später als drei Monate nach Ablegen der letzten Prüfungsleistung erfolgen. Bachelorurkunde und Bachelorzeugnis werden in deutscher und englischer Sprache ausgestellt. Bachelorurkunde und Zeugnis tragen das Datum der erfolgreichen Erbringung der letzten Prüfungsleistung. Diese Dokumente werden den Studierenden zusammen ausgehändigt. In der Bachelorurkunde wird die Verleihung des akademischen Bachelorgrades beurkundet. Die Bachelorurkunde wird von dem Präsidenten und den KIT-Dekaninnen/ den KIT-Dekanen der gemäß § 1 Satz 2 beteiligten KIT-Fakultäten unterzeichnet und mit dem Siegel des KIT versehen.

(2) Das Zeugnis enthält die Fach- und Modulnoten sowie die den Modulen und Fächern zugeordnete Leistungspunkte und die Gesamtnote. Sofern gemäß § 7 Abs. 2 Satz 2 eine differenzierte Bewertung einzelner Prüfungsleitungen vorgenommen wurde, wird auf dem Zeugnis auch die entsprechende Dezimalnote ausgewiesen; § 7 Abs. 4 bleibt unberührt. Das Zeugnis ist von den KIT-Dekaninnen/den KIT-Dekanen der gemäß § 1 Satz 2 beteiligten KIT-Fakultäten und von der/dem Vorsitzenden des Prüfungsausschusses zu unterzeichnen.

(3) Mit dem Zeugnis erhalten die Studierenden ein Diploma Supplement in deutscher und englischer Sprache, das den Vorgaben des jeweils gültigen ECTS Users‘ Guide entspricht, sowie ein Transcript of Records in deutscher und englischer Sprache.

(4) Das Transcript of Records enthält in strukturierter Form alle erbrachten Studien- und Prüfungsleistungen. Dies beinhaltet alle Fächer und Fachnoten samt den zugeordneten Leistungspunkten, die dem jeweiligen Fach zugeordneten Module mit den Modulnoten und zugeordneten Leistungspunkten sowie die den Modulen zugeordneten Erfolgskontrollen samt Noten und zugeordneten Leistungspunkten. Absatz 2 Satz 2 gilt entsprechend. Aus dem Transcript of Records soll die Zugehörigkeit von Lehrveranstaltungen zu den einzelnen Modulen deutlich erkennbar sein. Angerechnete Studien- und Prüfungsleistungen sind im Transcript of Records aufzunehmen. Alle Zusatzleistungen werden im Transcript of Records aufgeführt.

(5) Die Bachelorurkunde, das Bachelorzeugnis und das Diploma Supplement einschließlich des Transcript of Records werden vom Studierendenservice des KIT ausgestellt.

III. Schlussbestimmungen

§ 23 Bescheinigung von Prüfungsleistungen

Haben Studierende die Bachelorprüfung endgültig nicht bestanden, wird ihnen auf Antrag und gegen Vorlage der Exmatrikulationsbescheinigung eine schriftliche Bescheinigung ausgestellt, die die erbrachten Studien- und Prüfungsleistungen und deren Noten enthält und erkennen lässt, dass die Prüfung insgesamt nicht bestanden ist. Dasselbe gilt, wenn der Prüfungsanspruch erloschen ist.

§ 24 Aberkennung des Bachelorgrades

(1) Haben Studierende bei einer Prüfungsleistung getäuscht und wird diese Tatsache nach der Aushändigung des Zeugnisses bekannt, so können die Noten der Modulprüfungen, bei denen getäuscht wurde, berichtigt werden. Gegebenenfalls kann die Modulprüfung für „nicht ausreichend“ (5,0) und die Bachelorprüfung für „nicht bestanden“ erklärt werden.

(2) Waren die Voraussetzungen für die Zulassung zu einer Prüfung nicht erfüllt, ohne dass die/der Studierende darüber täuschen wollte, und wird diese Tatsache erst nach Aushändigung des Zeugnisses bekannt, wird dieser Mangel durch das Bestehen der Prüfung geheilt. Hat die/der Studierende die Zulassung vorsätzlich zu Unrecht erwirkt, so kann die Modulprüfung für „nicht ausreichend“ (5,0) und die Bachelorprüfung für „nicht bestanden“ erklärt werden.

(3) Vor einer Entscheidung des Prüfungsausschusses ist Gelegenheit zur Äußerung zu geben.

(4) Das unrichtige Zeugnis ist zu entziehen und gegebenenfalls ein neues zu erteilen. Mit dem unrichtigen Zeugnis ist auch die Bachelorurkunde einzuziehen, wenn die Bachelorprüfung aufgrund einer Täuschung für „nicht bestanden“ erklärt wurde.

(5) Eine Entscheidung nach Absatz 1 und Absatz 2 Satz 2 ist nach einer Frist von fünf Jahren ab dem Datum des Zeugnisses ausgeschlossen.

(6) Die Aberkennung des akademischen Grades richtet sich nach § 36 Abs. 7 LHG.

§ 25 Einsicht in die Prüfungsakten

(1) Nach Abschluss der Bachelorprüfung wird den Studierenden auf Antrag innerhalb eines Jahres Einsicht in das Prüfungsexemplar ihrer Bachelorarbeit, die darauf bezogenen Gutachten und in die Prüfungsprotokolle gewährt.

(2) Für die Einsichtnahme in die schriftlichen Modulprüfungen, schriftlichen Modulteilprüfungen bzw. Prüfungsprotokolle gilt eine Frist von einem Monat nach Bekanntgabe des Prüfungsergebnisses.

(3) Der/die Prüfende bestimmt Ort und Zeit der Einsichtnahme.

(4) Prüfungsunterlagen sind mindestens fünf Jahre aufzubewahren.

§ 26 Inkrafttreten, Übergangsvorschriften

(1) Diese Studien- und Prüfungsordnung tritt am 01.Oktober 2016 in Kraft.

(2) Gleichzeitig tritt die Studien- und Prüfungsordnung des KIT für den Bachelorstudiengang Mechatronik und Informationstechnik vom 24. Juli 2012 (Amtliche Bekanntmachung des KIT Nr. 38 vom 24. Juli 2012, zuletzt geändert durch die Dritte Satzung zur Änderung der Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Bachelorstudiengang Mechatronik und Informationstechnik vom 10. Juli 2015 (Amtliche Bekanntmachung des KIT Nr. 51 vom 15. Juli 2015), außer Kraft.

(3) Studierende, die auf Grundlage der Studien- und Prüfungsordnung für den Bachelorstudiengang Mechatronik und Informationstechnik vom 24. Juli 2012 (Amtliche Bekanntmachung des KIT Nr. 38 vom 24. Juli 2012) zuletzt geändert durch die Dritte Satzung zur Änderung der Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Bachelorstudiengang Mechatronik und Informationstechnik vom 10. Juli 2015 (Amtliche Bekanntmachung des KIT Nr. 51 vom 15.Juli 2015), ihr Studium am KIT aufgenommen haben, können Prüfungen auf Grundlage dieser Studien- und Prüfungsordnung letztmalig am 30. September 2021 ablegen.

(4) Studierende, die auf Grundlage der Studien- und Prüfungsordnung der Universität Karlsruhe für den interfakultativen Diplomstudiengang Mechatronik vom 15. August 2001 (Amtliche Bekanntmachungen der Universität Karlsruhe (TH) Nr. 24 vom 04. September 2001), zuletzt geändert durch die Satzung zur Änderung der Prüfungsordnung der Universität Karlsruhe (TH) für den interfakultativen Diplomstudiengang Mechatronik vom 10. September 2003 (Amtliche Bekanntmachungen der Universität Karlsruhe Nr. 34 vom 22. Oktober 2003), ihr Studium an der Universität Karlsruhe (TH) aufgenommen haben, können die Diplomprüfung einschließlich etwaiger Wiederholungen letztmalig bis zum 30. September 2017 ablegen.

Karlsruhe, den 03. Mai 2016

Prof. Dr.-Ing. Holger Hanselka
(Präsident)

Karlsruher Institut für Technologie

Die Forschungsuniversität in der Helmholtz-Gemeinschaft

Amtliche Bekanntmachung

2018 Ausgegeben Karlsruhe, den 28. September 2018 Nr. 54

I n h a l t Seite

Satzung zur Änderung der Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Bachelorstudiengang Mechatronik und Informationstechnik

vom 26. September 2018

Aufgrund von § 10 Absatz 2 Ziff. 5 und § 20 Absatz 2 Satz 1 des Gesetzes über das Karlsruher Institut für Technologie (KIT-Gesetz - KITG) in der Fassung vom 14. Juli 2009 (GBl. S. 317 f), zuletzt geändert durch Artikel 2 des Gesetzes zur Weiterentwicklung des Hochschulrechts (HRWeitEG) vom 13. März 2018 (GBl S. 85, 94), und § 32 Absatz 3 Satz 1 des Gesetzes über die Hochschulen in Baden-Württemberg (Landeshochschulgesetz - LHG) in der Fassung vom 1. Januar 2005 (GBl. S. 1 f), zuletzt geändert durch Artikel 1 des Gesetzes zur Weiterentwicklung des Hochschulrechts (HRWeitEG) vom 13. März 2018 (GBl. S. 85) hat der KIT-Senat am 17. September 2018 die folgende Satzung zur Änderung der Studien- und Prüfungsordnung für den Bachelorstudiengang Mechatronik und Informationstechnik vom 03. Mai 2016 (Amtliche Bekanntmachung des Karlsruher Instituts für Technologie (KIT) Nr. 29 vom 10. Mai 2016) beschlossen.

Der Präsident hat seine Zustimmung gemäß § 20 Absatz 2 Satz 1 KITG i.V.m. § 32 Absatz 3 Satz 1 LHG am 26. September 2018 erteilt.

Artikel 1 – Änderung der Studien- und Prüfungsordnung

1. § 8 Absatz 1 wird wie folgt gefasst:

„(1) Die Teilmodulprüfung „Technische Mechanik I“ im Modul „Technische Mechanik“ und die Modulprüfung im Modul „Lineare Elektrische Netze“ sind bis zum Ende des Prüfungszeitraums des zweiten Fachsemesters abzulegen (Orientierungsprüfungen).

2. § 12 Absatz 1 wird wie folgt geändert:

a) Satz 1 wird wie folgt gefasst:

   „Es gelten die Vorschriften des Gesetzes zum Schutz von Müttern bei der Arbeit, in der Ausbildung und im Studium (Mutterschutzgesetz – MuSchG) in seiner jeweils geltenden Fassung.“

b) Satz 2 wird aufgehoben.

c) Die bisherigen Sätze 3 und 4 werden die Sätze 2 und 3

3. § 14 Absatz 1a wird wie folgt geändert:

a) In Satz 1 wird die Angabe „12 LP“ durch die Angabe „15 LP“ ersetzt.

b) In Satz 2 wird nach dem Wort „Bachelorarbeit“ die Angabe „mit 12 LP“ und nach dem Wort „Präsentation“ die Angabe „mit 3 LP“ eingefügt.

4. § 17 Absatz 7 wird wie folgt geändert:

In Satz 4 werden nach dem Wort „Entscheidung“ die Wörter „schriftlich oder zur Niederschrift“ gestrichen.

5. § 18 Absatz 3 wird wie folgt geändert:

Nach dem Wort „sofern“ werden die Wörter „eine der gemäß § 1 Satz 2 beteiligten KIT-Fakultäten eine Prüfungsbefugnis erteilt hat und“ gestrichen.

6. § 20 Absatz 2 wird wie folgt geändert:

a) In Satz 1 Nummer 2 wird nach dem Wort „von“ die Angabe „37 LP“ durch die Angabe „38 LP“ ersetzt.

b) In Satz 1 Nummer 3 wird nach dem Wort „von“ die Angabe „6 LP“ durch die Angabe „2 LP“ ersetzt.

c) Nach Satz 1 wird folgender Satz 2 eingefügt:

„Die Vermittlung weiterer überfachlicher Qualifikationen im Umfang von 4 LP gemäß § 16 findet im Rahmen der fachwissenschaftlichen Module Lineare Elektrische Netze, Elektronische Schaltungen sowie Signale und Systeme im Pflichtfach Ingenieurwissenschaftliche Grundlagen statt.“

d) Der bisherige Satz 2 wird Satz 3.

7. Dem § 21 Absatz 2 wird folgender Satz angefügt:

„Dabei wird die Note des Moduls Bachelorarbeit mit dem doppelten Gewicht berücksichtigt.“

Artikel 2 – Inkrafttreten, Übergangsvorschrift

(1) Die Satzung tritt am 01. Oktober 2018 in Kraft und gilt für

1. Studierende, die ihr Studium im Bachelorstudiengang Mechatronik und Informationstechnik am KIT im ersten Fachsemester aufnehmen, sowie für

2. Studierende, die ihr Studium im Bachelorstudiengang Mechatronik und Informationstechnik am KIT in einem höheren Fachsemester aufnehmen, sofern dieses Fachsemester nicht über dem Fachsemester liegt, das der erste Jahrgang nach Ziff. 1 erreicht.

(2) Die Studien- und Prüfungsordnung des KIT für den Bachelorstudiengang Mechatronik und Informationstechnik in der Fassung vom 03. Mai 2016 (Amtliche Bekanntmachung des KIT Nr. 29 vom 10. Mai 2016) gilt für

1. Studierende, die ihr Studium im Bachelorstudiengang Mechatronik und Informationstechnik am KIT zuletzt im Sommersemester 2018 aufgenommen haben, sowie für

2. Studierende, die ihr Studium im Bachelorstudiengang Mechatronik und Informationstechnik am KIT ab dem Wintersemester 2018/19 in einem höheren Fachsemester aufnehmen, sofern das Fachsemester über dem liegt, das der erste Jahrgang nach Absatz 1 Ziff. 1 erreicht hat.

(3) Studierende, die auf Grundlage der Studien- und Prüfungsordnung für den Bachelorstudiengang Mechatronik und Informationstechnik in der Fassung vom 03. Mai 2016 (Amtliche Bekanntmachung des Karlsruher Instituts für Technologie (KIT) Nr. 29 vom 10. Mai 2016) ihr Studium am KIT aufgenommen haben, können Prüfungen gemäß der vorgenannten Studien- und Prüfungsordnung letztmalig am 30. September 2023 ablegen.

Karlsruhe, den 26. September 2018

Prof. Dr.-Ing. Holger Hanselka
(Präsident)

7 Field of study structure

Mandatory	
Orientation Exam	
Bachelor Thesis	15 CR
Internship	15 CR
Engineering Fundamentals	110 CR
Specialization in Mechatronics	38 CR
Interdisciplinary Qualifications	2 CR
Voluntary	
Additional Examinations	
Master Transfer Account	

7.1 Orientation Exam

Mandatory		
M-MACH-104333	Orientation Exam	0 CR

7.2 Bachelor Thesis

Credits
15

Mandatory		
M-MACH-104262	Bachelor Thesis	15 CR

7.3 Internship

Credits
15

Mandatory		
M-MACH-104265	Internship	15 CR

7.4 Engineering Fundamentals

Credits
110

Mandatory		
M-MATH-102859	Advanced Mathematics	21 CR
M-MACH-102402	Engineering Mechanics	18 CR
M-ETIT-104519	Linear Electric Circuits	9 CR
M-ETIT-104465	Electronic Devices and Circuits	7 CR
M-ETIT-104428	Electromagnetical Fields	6 CR
M-ETIT-102124	Electrical Machines and Power Electronics	6 CR
M-MACH-101299	Mechanical Design	8 CR
M-MACH-102549	Manufacturing Processes	4 CR
M-ETIT-102102	Digital Technology	6 CR
M-ETIT-104539	information technology	6 CR
M-ETIT-104525	Signals and Systems	7 CR
M-ETIT-102181	System Dynamics and Control Engineering	6 CR
M-MACH-102749	Mechatronical Systems and Products	6 CR

7.5 Specialization in Mechatronics

Credits
38

Election notes
Compulsary Elective Modules

1. Part 1: Electrical Engineering and Information Technology
You have to select one of the following combinations:
• „Elektroenergiesysteme" together with „Hybride und elektrische Fahrzeuge" (9 LP)
• „Informationstechnik II und Automatisierungstechnik“ together with „Praktischer Entwurf Regelungstechnischer Systeme“ (10 LP)
• „Wahrscheinlichkeitstheorie" together with „Nachrichtentechnik I" (11 LP)
• „Elektromagnetische Wellen" together with „Grundlagen der Hochfrequenztechnik" (12 LP)

2. Part 2: Mechanical Engineering
You have to select one of the listed modules.

3. Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management
You have to select one or two modules so that 8 LP are achieved or for the first time exceeded.

4. Part 4: Supplementary Modules
If you have not achieved 38 LP after having selected modules in part 1-3, you have to select supplementary modules until 38 LP are achieved. It is not allowed to select further modules, if 38 LP are achieved or for the first time exceeded. Modules already selected in part 1-3 cannot be acknowledged as supplementary modules.

Election block: Vertiefung in der Mechatronik: Wahlblock 1: Elektrotechnik und Informationstechnik (2 items)		
M-ETIT-102156	Electric Energy Systems	5 CR
M-ETIT-100514	Hybrid and Electric Vehicles	4 CR
M-ETIT-104547	Information Technology II and Automation Technology	4 CR
M-ETIT-103814	Practical Design of Control Systems	6 CR
M-ETIT-102104	Theory of Probability	5 CR
M-ETIT-102103	Communication Engineering I	6 CR
M-ETIT-104515	Electromagnetical Waves	6 CR
M-ETIT-102129	Fundamentals on High Frequency Techniques	6 CR
Election block: Vertiefung in der Mechatronik: Wahlblock 2: Maschinenbau (1 item)		
M-MACH-102567	Material Science and Engineering	9 CR
M-MACH-102386	Technical Thermodynamics and Heat Transfer I	8 CR
M-MACH-102565	Fluid Mechanics	8 CR
M-MACH-102829	Mechanical Design III+IV	13 CR
Election block: Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften (at least 8 credits)		
M-INFO-100803	Real-Time Systems	6 CR
M-INFO-103179	Computer Organization	6 CR
M-INFO-101174	Programming	6 CR
M-INFO-101175	Software Engineering I	6 CR
M-INFO-100893	Robotics I - Introduction to Robotics	6 CR
M-INFO-100757	Mechano-Informatics and Robotics	4 CR
M-WIWI-101418	Introduction to Operations Research	9 CR
M-ETIT-102156	Electric Energy Systems	5 CR
M-ETIT-100514	Hybrid and Electric Vehicles	4 CR
M-ETIT-104547	Information Technology II and Automation Technology	4 CR
M-ETIT-103814	Practical Design of Control Systems	6 CR
M-ETIT-102104	Theory of Probability	5 CR
M-ETIT-102103	Communication Engineering I	6 CR
M-ETIT-104515	Electromagnetical Waves	6 CR
M-ETIT-102129	Fundamentals on High Frequency Techniques	6 CR
M-MACH-102567	Material Science and Engineering	9 CR

M-MACH-102386	Technical Thermodynamics and Heat Transfer I	8 CR
M-MACH-102565	Fluid Mechanics	8 CR
M-MACH-102829	Mechanical Design III+IV	13 CR
Election block: Vertiefung in der Mechatronik: Ergänzungsbereich (between 1 and 13 credits)		
M-ETIT-102156	Electric Energy Systems	5 CR
M-ETIT-100514	Hybrid and Electric Vehicles	4 CR
M-ETIT-104547	Information Technology II and Automation Technology	4 CR
M-ETIT-103814	Practical Design of Control Systems	6 CR
M-ETIT-102104	Theory of Probability	5 CR
M-ETIT-102103	Communication Engineering I	6 CR
M-ETIT-104515	Electromagnetical Waves	6 CR
M-ETIT-102129	Fundamentals on High Frequency Techniques	6 CR
M-MACH-102567	Material Science and Engineering	9 CR
M-MACH-102386	Technical Thermodynamics and Heat Transfer I	8 CR
M-MACH-102565	Fluid Mechanics	8 CR
M-MACH-102829	Mechanical Design III+IV	13 CR
M-INFO-100803	Real-Time Systems	6 CR
M-INFO-103179	Computer Organization	6 CR
M-INFO-101174	Programming	6 CR
M-INFO-101175	Software Engineering I	6 CR
M-INFO-100893	Robotics I - Introduction to Robotics	6 CR
M-INFO-100757	Mechano-Informatics and Robotics	4 CR
M-WIWI-101418	Introduction to Operations Research	9 CR
M-ETIT-100469	Laboratory Adaptive Sensor Electronics	6 CR
M-ETIT-100509	Optoelectronic Components	4 CR
M-ETIT-103271	Battery Modeling in MATLAB	3 CR
M-ETIT-104823	Laboratory for Applied Machine Learning Algorithms	6 CR
M-INFO-100736	Introduction to Video Analysis	3 CR
M-ETIT-101847	Dosimetry of Ionising Radiation	3 CR
M-INFO-100833	Software Engineering II	6 CR
M-INFO-104897	Robotics III - Sensors and Perception in Robotics	3 CR
M-MACH-102830	Technical Thermodynamics and Heat Transfer II	7 CR
M-ETIT-100440	Communications Engineering II	4 CR
M-ETIT-104067	Optics and Solid State Electronics	8 CR
M-INFO-100729	Human Computer Interaction	6 CR
M-ETIT-100384	Medical Imaging Techniques I	3 CR
M-ETIT-100565	Antenna and Multiple Antenna Systems	6 CR
M-INFO-103294	Wearable Robotic Technologies	4 CR
M-ETIT-100390	Physiology and Anatomy for Engineers I	3 CR
M-ETIT-100407	Power Generation	3 CR
M-ETIT-100411	Photovoltaic System Design	3 CR
M-ETIT-100465	VLSI Technology	3 CR
M-ETIT-104534	Complex Analysis and Integral Transformations	4 CR
M-INFO-100895	Information Processing in Sensor Networks	6 CR
M-MACH-102831	Engineering Mechanics IV	5 CR
M-ETIT-100397	Seminar Power Electronics in Regenerative Energy Systems	4 CR
M-ETIT-100518	Laboratory Circuit Design	6 CR
M-ETIT-100562	Radiation Protection	3 CR
M-ETIT-101970	Basic Principles and Technology of Superconducting Magnets	3 CR
M-ETIT-103037	Seminar Battery	3 CR
M-ETIT-103263	Laboratory Hardware and Software in Power Electronic Systems	6 CR

M-INFO-100030	Algorithms I	6 CR
M-INFO-100764	Accessibility - Assistive Technologies for Visually Impaired Persons	3 CR
M-INFO-100824	Human-Machine-Interaction in Anthropomatics: Basics	3 CR
M-INFO-101249	Mobile Computing and Internet of Things	5 CR
M-ETIT-100383	Seminar on Selected Chapters of Biomedical Engineering	3 CR
M-ETIT-100425	Microwave Laboratory I	6 CR
M-ETIT-100480	Optoelectronics	4 CR
M-INFO-100814	Biologically Inspired Robot	3 CR
M-INFO-100819	Cognitive Systems	6 CR
M-MACH-102692	Electric Rail Vehicles	4 CR
M-INFO-104460	Deep Learning and Neural Networks	6 CR
M-MACH-104919	Advanced Topics and Methods in Mechanical Engineering 1	4 CR
M-MACH-105091	Advanced Topics and Methods in Mechanical Engineering 2	4 CR

7.6 Interdisciplinary Qualifications

Credits
2

Mandatory		
M-MACH-104355	Soft Skills	2 CR

7.7 Additional Examinations

Election block: Zusatzleistungen (at most 30 credits)		
M-MACH-104332	Further Examinations	30 CR

7.8 Master Transfer Account

Election block: Mastervorzug (at most 30 credits)		
M-ETIT-100361	Distributed Discrete Event Systems	4 CR
M-ETIT-100374	Control of Linear Multivariable Systems	6 CR
M-ETIT-100378	Sensors	3 CR
M-ETIT-100384	Medical Imaging Techniques I	3 CR
M-ETIT-100387	Biomedical Measurement Techniques I	3 CR
M-ETIT-100389	Laboratory Biomedical Engineering	6 CR
M-ETIT-100394	Practical Aspects of Electrical Drives	4 CR
M-ETIT-100401	Lab Course Electrical Drives and Power Electronics	6 CR
M-ETIT-100419	Lab Course Electrical Power Engineering	6 CR
M-ETIT-100514	Hybrid and Electric Vehicles	4 CR
M-ETIT-100533	Power Electronics	5 CR
M-ETIT-100534	Power Transmission and Power Network Control	5 CR
M-ETIT-102734	Materials	5 CR
M-ETIT-103040	Control Systems Design Lab	6 CR
M-ETIT-103041	Advanced Control Techniques Laboratory	6 CR
M-ETIT-103242	Metrology in Mechatronics	5 CR
M-ETIT-103448	Laboratory Mechatronic Measurement Systems	6 CR
M-ETIT-104475	Project Management in the Development of Products for Safety-Critical Applications	4 CR
M-INFO-100819	Cognitive Systems	6 CR
M-INFO-100893	Robotics I - Introduction to Robotics	6 CR
M-INFO-102224	Practical Project Robotics and Automation I (Software)	6 CR
M-INFO-102230	Practical Project Robotics and Automation II (Hardware)	6 CR
M-INFO-102522	Robotics - Practical Course	6 CR
M-INFO-102756	Robotics II: Humanoid Robotics	3 CR
M-INFO-103705	Nonlinear Model Predictive Control - Theory and Applications	5 CR
M-MACH-100487	Microactuators	4 CR
M-MACH-100489	BioMEMS - Microsystems Technologies for Life Sciences and Medicine I	4 CR
M-MACH-100501	Automotive Engineering I	8 CR
M-MACH-100502	Automotive Engineering II	4 CR
M-MACH-101286	Machine Tools and Industrial Handling	9 CR
M-MACH-102683	Rail Vehicle Technology	4 CR
M-MACH-102684	CAE-Workshop	4 CR
M-MACH-102690	Fundamentals of Energy Technology	8 CR
M-MACH-102691	Introduction to Microsystem Technology I	4 CR
M-MACH-102695	Motor Vehicle Laboratory	4 CR
M-MACH-102702	Organ Support Systems	4 CR
M-MACH-102706	Introduction to Microsystem Technology II	4 CR
M-MACH-102711	Production Techniques Laboratory	4 CR
M-MACH-102718	Product Development - Methods of Product Development	6 CR
M-MACH-102720	Principles of Medicine for Engineers	4 CR
M-MACH-103205	Engineering Mechanics	5 CR
M-MATH-100536	Numerical Methods	5 CR
M-INFO-104897	Robotics III - Sensors and Perception in Robotics	3 CR

Modelled Conditions
The following conditions have to be fulfilled:

1. You need to earn at least 120 credits in the following fields:
    - Bachelor Thesis
    - Internship
    - Engineering Fundamentals
    - Interdisciplinary Qualifications
    - Specialization in Mechatronics

8 Modules

M 8.1 Module: Accessibility - Assistive Technologies for Visually Impaired Persons (2400052) [M-INFO-100764]

Responsible: Prof. Dr.-Ing. Rainer Stiefelhagen
Organisation: KIT Department of Informatics
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Language	Level	Version
3	Each summer term	1 term	German	3	1

Mandatory			
T-INFO-101301	Accessibility - Assistive Technologies for Visually Impaired Persons	3 CR	Stiefelhagen

8.2 Module: Advanced Control Techniques Laboratory [M-ETIT-103041]

Responsible: Prof. Dr.-Ing. Sören Hohmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Recurrence	Language	Level	Version
6	Each term	German	4	2

Mandatory			
T-ETIT-106054	Advanced Control Techniques Laboratory	6 CR	Hohmann

Prerequisites
The moduls "M-ETIT-100372 - Praktikum Automatisierungstechnik A" and "M-ETIT-100373 - Praktikum Automatisierungstechnik B" may neither be started nor completed.

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

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

Credits	Recurrence	Language	Level	Version
21	Annual	German	3	1

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

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

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

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

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

Prerequisites
None.

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

Workload

In class: 270 hours

- lectures, tutorials and examinations

Independent study: 360 hours

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

Learning type

Lecture, problem classes, tutorials

8.4 Module: Advanced Topics and Methods in Mechanical Engineering 1 [M-MACH-104919]

Responsible: Prof. Dr.-Ing. Peter Gratzfeld
Organisation: KIT Department of Mechanical Engineering
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
4	German	3	1

Election notes
Only one of the listed bricks can be choosen in the compulsory-elective block.

Election block: Weiterführende Themen und Methoden im Maschinenbau 1 (1 item)			
T-MACH-105381	Virtual Engineering (Specific Topics)	4 CR	Ovtcharova
T-MACH-105212	CAE-Workshop	4 CR	Albers, Matthiesen
T-MACH-105209	Introduction into the Multi-Body Dynamics	5 CR	Seemann
T-MACH-102093	Fluid Power Systems	4 CR	Geimer, Pult
T-MACH-102163	Basics of Technical Logistics	6 CR	Mittwollen, Oellerich
T-MACH-105213	Fundamentals of Combustion I	4 CR	Maas, Sommerer
T-MACH-105210	Machine Dynamics	5 CR	Proppe
T-MACH-105293	Mathematical Methods in Dynamics	6 CR	Proppe
T-MACH-100297	Mathematical Methods in Strength of Materials	5 CR	Böhlke
T-MACH-105294	Mathematical Methods of Vibration Theory	6 CR	Seemann
T-MACH-105295	Mathematical Methods in Fluid Mechanics	6 CR	Frohnapfel
T-MACH-105303	Modelling of Microstructures	5 CR	August, Nestler
T-MACH-100300	Modelling and Simulation	5 CR	Gumbsch, Nestler
T-MACH-100530	Physics for Engineers	5 CR	Dienwiebel, Gumbsch, Nesterov-Müller, Weygand
T-MACH-102102	Physical Basics of Laser Technology	5 CR	Schneider
T-MACH-105147	Product Lifecycle Management	4 CR	Ovtcharova
T-MACH-100531	Systematic Materials Selection	5 CR	Dietrich
T-MACH-105652	Fundamentals of Combustion Engine Technology	5 CR	Bernhardt, Kubach, Pfeil, Toedter, Wagner
T-MACH-102083	Integrated Information Systems for Engineers	4 CR	Ovtcharova
T-MACH-105290	Vibration Theory	5 CR	Fidlin, Seemann
T-MACH-105292	Heat and Mass Transfer	4 CR	Bockhorn, Maas
T-MACH-100532	Scientific Computing for Engineers	5 CR	Gumbsch, Weygand

Competence Certificate
oral/written exam

Competence Goal
The Student learn to evaluate, select and apply scientific methods in Mechanical Engineering in different areas (according to their choice of course).

Prerequisites
None

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

Learning type
Lectures, Tutorials

M 8.5 Module: Advanced Topics and Methods in Mechanical Engineering 2 [M-MACH-105091]

Responsible: Prof. Dr.-Ing. Peter Gratzfeld
Organisation: KIT Department of Mechanical Engineering
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
4	German	3	1

Election notes
Only one of the listed bricks can be choosen in the compulsory-elective block.

Election block: Weiterführende Themen und Methoden im Maschinenbau 2 (1 item)			
T-MACH-105381	Virtual Engineering (Specific Topics)	4 CR	Ovtcharova
T-MACH-105212	CAE-Workshop	4 CR	Albers, Matthiesen
T-MACH-105209	Introduction into the Multi-Body Dynamics	5 CR	Seemann
T-MACH-102093	Fluid Power Systems	4 CR	Geimer, Pult
T-MACH-102163	Basics of Technical Logistics	6 CR	Mittwollen, Oellerich
T-MACH-105213	Fundamentals of Combustion I	4 CR	Maas, Sommerer
T-MACH-105210	Machine Dynamics	5 CR	Proppe
T-MACH-105293	Mathematical Methods in Dynamics	6 CR	Proppe
T-MACH-100297	Mathematical Methods in Strength of Materials	5 CR	Böhlke
T-MACH-105294	Mathematical Methods of Vibration Theory	6 CR	Seemann
T-MACH-105295	Mathematical Methods in Fluid Mechanics	6 CR	Frohnapfel
T-MACH-105303	Modelling of Microstructures	5 CR	August, Nestler
T-MACH-100300	Modelling and Simulation	5 CR	Gumbsch, Nestler
T-MACH-100530	Physics for Engineers	5 CR	Dienwiebel, Gumbsch, Nesterov-Müller, Weygand
T-MACH-102102	Physical Basics of Laser Technology	5 CR	Schneider
T-MACH-105147	Product Lifecycle Management	4 CR	Ovtcharova
T-MACH-100531	Systematic Materials Selection	5 CR	Dietrich
T-MACH-105652	Fundamentals of Combustion Engine Technology	5 CR	Bernhardt, Kubach, Pfeil, Toedter, Wagner
T-MACH-102083	Integrated Information Systems for Engineers	4 CR	Ovtcharova
T-MACH-105290	Vibration Theory	5 CR	Fidlin, Seemann
T-MACH-105292	Heat and Mass Transfer	4 CR	Bockhorn, Maas
T-MACH-100532	Scientific Computing for Engineers	5 CR	Gumbsch, Weygand

Competence Certificate
oral/written exam

Competence Goal
The Student learn to evaluate, select and apply scientific methods in Mechanical Engineering in different areas (according to their choice of course).

Prerequisites
None

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

Learning type
Lectures, Tutorials

M 8.6 Module: Algorithms I [M-INFO-100030]

Responsible: Prof. Dr. Peter Sanders
Organisation: KIT Department of Informatics
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	3	1

Mandatory			
T-INFO-100001	Algorithms I	6 CR	Sanders

M 8.7 Module: Antenna and Multiple Antenna Systems [M-ETIT-100565]

Responsible: Prof. Dr.-Ing. Thomas Zwick
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Duration	Language	Level	Version
6	1 term	German	3	2

Mandatory			
T-ETIT-106491	Antenna and Multiple Antenna Systems	6 CR	Zwick

M 8.8 Module: Automotive Engineering I [M-MACH-100501]

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

Part of: Master Transfer Account

Credits	Recurrence	Language	Level	Version
8	Once	German	4	1

Mandatory			
T-MACH-100092	Automotive Engineering I	8 CR	Gauterin, Unrau

Competence Certificate
written exam

Competence Goal
The students know the movements and the forces at the vehicle and are familiar with active and passive security. 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 judge and to develop the complex system "vehicle".

Prerequisites
Only one out of the two moduls "M-MACH-100501 - Grundlagen der Fahrzeugtechnik I" and "M-MACH-102686 - Automotive Engineering I" is allowed.

Content
1. History and future of the automobile

2. Driving mechanics: driving resistances and driving performances, mechanics of the longitudinal and transverse forces, passive safety

3. Engines: combustion engine, alternative drives (e.g. electric motor, fuel cell)

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

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

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

Literature
1. Mitschke, M./ Wallentowitz, H.: Dynamik der Kraftfahrzeuge, Springer-Verlag, Berlin, 2004

2. Braes, H.-H.; Seiffert, U.: Handbuch Kraftfahrzeugtechnik, Vieweg&Sohn Verlag, 2005

3. Gnadler, R.: Script to the lecture 'Automotive Engineering I'

M 8.9 Module: Automotive Engineering II [M-MACH-100502]

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

Organisation: KIT Department of Mechanical Engineering

Part of: Master Transfer Account

Credits	Recurrence	Language	Level	Version
4	Once	German	4	1

Mandatory			
T-MACH-102117	Automotive Engineering II	4 CR	Gauterin, Unrau

Competence Certificate
A performance assessment is obligatory and can be oral, a written exam, or of another kind.

Competence Goal
The students have an overview of the modules, which are necessary for the road holding of a motor vehicle and the power transmission between vehicle bodywork and roadway. They have knowledge of different wheel suspensions, the tyres, the steering elements and the brakes. They know different execution forms, the function and the influence on the driving or brake behavior. They are able to develop the appropriate components correctly. They are ready to analyze, to judge and to optimize the complex relationship of the different components under consideration of boundary conditions.

Prerequisites
none

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, retarder, comparison of the designs

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

Literature
1. Heißing, B./Ersoy, M.: Fahrwerkhandbuch: Grundlagen, Fahrdynamik, Komponenten, Systeme, Mechatronik, Perspektiven, Vieweg-Verlag, Wiesbaden, 2011

2. Breuer, B./Bill, K.-H.: Bremsenhandbuch: Grundlagen - Komponenten - Systeme - Fahrdynamik, Vieweg-Verlag, Wiesbaden, 2012

3. Gnadler, R.: Script to the lecture 'Automotive Engineering II'

M 8.10 Module: Bachelor Thesis [M-MACH-104262]

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

Credits	Language	Level	Version
15	German	3	1

Mandatory			
T-MACH-108800	Bachelor Thesis	12 CR	Gratzfeld
T-MACH-107760	Presentation	3 CR	Gratzfeld

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

The scope of the module Bachelor Thesis corresponds to 15 ECTS (written thesis 12 LP, oral presentation 3 ECTS). The maximal processing time of the bachelor thesis takes 6 months. The examination board defines the languages the thesis has to be written in. 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.

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

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

Prerequisites
The requirement for admission to the bachelor's thesis module are 120 ECTS. As to exceptions, the examination board decides on a request of the student.

Modeled Conditions
The following conditions have to be fulfilled:

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

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
450 hours

Learning type
Bachelor Thesis and presentation

8.11 Module: Basic Principles and Technology of Superconducting Magnets [M-ETIT-101970]

Responsible: Prof. Dr. Bernhard Holzapfel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
3	German	3	1

Mandatory			
T-ETIT-104470	Basic Principles and Technology of Superconducting Magnets	3 CR	Holzapfel

Prerequisites
none

Annotation
Elective Course in other Fields of Study.

M 8.12 Module: Battery Modeling in MATLAB [M-ETIT-103271]

Responsible: Dr.-Ing. Andre Weber
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
3	German	3	1

Mandatory			
T-ETIT-106507	Battery Modeling in MATLAB	3 CR	Weber

Prerequisites
none

M 8.13 Module: Biologically Inspired Robot (24619) [M-INFO-100814]

Responsible: Prof. Dr.-Ing. Rüdiger Dillmann
Organisation: KIT Department of Informatics
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Language	Level	Version
3	Each summer term	1 term	German	3	1

Mandatory			
T-INFO-101351	Biologically Inspired Robot	3 CR	Dillmann

M 8.14 Module: Biomedical Measurement Techniques I [M-ETIT-100387]

Responsible: Prof. Dr. Werner Nahm
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Language	Level	Version
3	German	4	2

Mandatory			
T-ETIT-106492	Biomedical Measurement Techniques I	3 CR	Nahm

8.15 Module: BioMEMS - Microsystems Technologies for Life Sciences and Medicine I [M-MACH-100489]

Responsible: Prof. Dr. Andreas Guber
Organisation: KIT Department of Mechanical Engineering

Part of: Master Transfer Account

Credits	Recurrence	Language	Level	Version
4	Once	German	4	1

Mandatory			
T-MACH-100966	BioMEMS - Microsystems Technologies for Life-Sciences and Medicine I	4 CR	Guber

Competence Certificate
Written exam (75 min)

Competence Goal
The lecture will first address relevant microtechnical manufacturing methods. Then, selected biomedical applications will be presented, as the increasing use of microstructures and microsystems in Life-Sciences und in medicine leads to improved medico-technical products, instruments, and operation and analysis systems.

Prerequisites
none

Content
Introduction into various microtechnical manufacturing methods: LIGA, Micro milling, Silicon Micromachining, Laser Microstructuring, µEDM, Metal-Etching
Biomaterials, Sterilisation.
Examples of use in the life science sector: basic micro fluidic strucutures: micro channels, micro filters, micromixers, micropumps, microvalves, Micro and nanotiter plates, Microanalysis systems (µTAS),
Lab-on-chip applications.

Workload
Literature: 20 h

Lessions: 21 h

Preparation and Review: 50 h

Exam preparation: 30 h

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

8.16 Module: CAE-Workshop [M-MACH-102684]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: Master Transfer Account

Credits	Language	Level	Version
4	German	4	2

Mandatory			
T-MACH-105212	CAE-Workshop	4 CR	Albers, Matthiesen

Competence Certificate
Depending on the manner in which the CAE-Workshop will be credited.

optional compulsory subject: written-practical exam, duration 60 min

optional subject: written-practical exam, duration 45 min

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

Competence Goal
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.

Prerequisites
None

Content

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

Workload
regular attendance: 31.5 h

self-study: 58 h

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

discussing and presenting results in small groups

Learning type
Seminar

Literature
The workshop script will be allocated at Ilias.

M 8.17 Module: Cognitive Systems (24572) [M-INFO-100819]

Responsible: Prof. Dr.-Ing. Rüdiger Dillmann
Prof. Dr. Alexander Waibel

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)
Master Transfer Account

Credits	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-INFO-101356	Cognitive Systems	6 CR	Dillmann, Waibel

8.18 Module: Communication Engineering I [M-ETIT-102103]

Responsible: Dr.-Ing. Holger Jäkel

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 1: Elektrotechnik und Informationstechnik)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
6	German	3	1

Mandatory			
T-ETIT-101936	Communication Engineering I	6 CR	Jäkel

Prerequisites
none

M 8.19 Module: Communications Engineering II [M-ETIT-100440]

Responsible: Dr.-Ing. Holger Jäkel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Duration	Language	Level	Version
4	1 term	German	3	2

Mandatory			
T-ETIT-100745	Communications Engineering II	4 CR	Jäkel

Prerequisites
None

M 8.20 Module: Complex Analysis and Integral Transformations [M-ETIT-104534]

Responsible: Prof. Dr.-Ing. Sören Hohmann
Dr.-Ing. Mathias Kluwe

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
4	German	3	1

Mandatory			
T-ETIT-109285	Complex Analysis and Integral Transformations	4 CR	Kluwe

M 8.21 Module: Computer Organization [M-INFO-103179]

Responsible: Prof. Dr. Wolfgang Karl
Organisation: KIT Department of Informatics
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
6	German	3	1

Mandatory			
T-INFO-103531	Computer Organization	6 CR	Karl

M 8.22 Module: Control of Linear Multivariable Systems [M-ETIT-100374]

Responsible: Prof. Dr.-Ing. Sören Hohmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Duration	Language	Level	Version
6	1 term	German	4	1

Mandatory			
T-ETIT-100666	Control of Linear Multivariable Systems	6 CR	Hohmann

Prerequisites
none

M 8.23 Module: Control Systems Design Lab [M-ETIT-103040]

Responsible: Prof. Dr.-Ing. Sören Hohmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Language	Level	Version
6	German	4	1

Mandatory			
T-ETIT-106053	Control Systems Design Lab	6 CR	Hohmann

Prerequisites
None

M 8.24 Module: Deep Learning and Neural Networks [M-INFO-104460]

Responsible: Prof. Dr. Alexander Waibel
Organisation: KIT Department of Informatics
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
6	German	3	1

Mandatory			
T-INFO-109124	Deep Learning and Neural Networks	6 CR	Waibel

M 8.25 Module: Digital Technology [M-ETIT-102102]

Responsible: Prof. Dr.-Ing. Jürgen Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Engineering Fundamentals

Credits	Language	Level	Version
6	German	1	1

Mandatory			
T-ETIT-101918	Digital Technology	6 CR	Becker

Prerequisites
none

M 8.26 Module: Distributed Discrete Event Systems [M-ETIT-100361]

Responsible: Prof. Dr.-Ing. Fernando Puente León
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Language	Level	Version
4	German	4	1

Mandatory			
T-ETIT-100960	Distributed Discrete Event Systems	4 CR	Puente León

Prerequisites
none

M 8.27 Module: Dosimetry of Ionising Radiation [M-ETIT-101847]

Responsible: Prof. Dr. Olaf Dössel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
3	German	3	1

Mandatory			
T-ETIT-104505	Dosimetry of Ionising Radiation	3 CR	Dössel

M 8.28 Module: Electric Energy Systems [M-ETIT-102156]

Responsible: Prof. Dr.-Ing. Thomas Leibfried
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 1: Elektrotechnik und Informationstechnik)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
5	German	3	1

Mandatory			
T-ETIT-101923	Electric Energy Systems	5 CR	Leibfried

Prerequisites
none

M 8.29 Module: Electric Rail Vehicles [M-MACH-102692]

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

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
4	German	3	1

Mandatory			
T-MACH-102121	Electric Rail Vehicles	4 CR	Gratzfeld

Competence Certificate
Oral examination

Duration: ca. 20 minutes

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

Competence Goal

- The students know the history of electric traction in railway transportation from the very beginning to modern vehicles with three-phase traction drives and understand their economic impact.
- They know the basics of railway transportation, vehicle dynamics and wheel-rail-contact and can deduct the requirements for electric rail vehicles out of it.
- They understand purpose, design and functionality of electric traction drives.
- They know the basic setup of train control management system and understand the most important functions.
- They are informed about actual concepts and new developments in the field of electric railway vehicles.
- They learn about the different systems of traction power supply with its advantages and disadvantages.

Prerequisites
none

Content

1. Introduction: history of electric traction in railway vehicles, economic impact
2. Wheel-rail-contact: carrying of vehicle mass, adhesion, current return
3. Vehicle dynamics: tractive and brake effort, driving resistance, inertial force, load cycles
4. Electric drives: purpose of electric drive and basic configurations, traction motors (induction machine, synchronous machine with permanent magnets), drives for vehicles at dc and ac lines, drives for vehicle without contact wire, hybrids, conventional drives for existing vehicles
5. Train control management system: definitions, networks, bus systems, components, examples
6. Vehicle concepts: modern vehicle concepts for mass transit and electric main line
7. Traction power supply: dc and ac networks, energy management, design aspects

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

Workload
Regular attendance: 21 hours

Self-study: 21 hours

Exam and preparation: 78 hours

Learning type
Lecture

M 8.30 Module: Electrical Machines and Power Electronics [M-ETIT-102124]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Engineering Fundamentals

Credits	Language	Level	Version
6	German	2	1

Mandatory			
T-ETIT-101954	Electrical Machines and Power Electronics	6 CR	Becker

Prerequisites
none

M 8.31 Module: Electromagnetical Fields [M-ETIT-104428]

Responsible: Prof. Dr. Martin Doppelbauer
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Engineering Fundamentals

Credits	Language	Level	Version
6	German	1	1

Mandatory			
T-ETIT-109078	Electromagnetical Fields	6 CR	Doppelbauer

Prerequisites
none

M 8.32 Module: Electromagnetical Waves [M-ETIT-104515]

Responsible: Prof. Dr.-Ing. Sebastian Randel

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 1: Elektrotechnik und Informationstechnik)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
6	German	3	1

Mandatory			
T-ETIT-109245	Electromagnetical Waves	6 CR	Randel

M 8.33 Module: Electronic Devices and Circuits [M-ETIT-104465]

Responsible: Prof. Dr. Michael Siegel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Engineering Fundamentals

Credits	Language	Level	Version
7	German	1	1

Mandatory			
T-ETIT-109318	Electronic Devices and Circuits	6 CR	Siegel
T-ETIT-109138	Electronic Devices an Circuits - Workshop	1 CR	Siegel

Prerequisites
None

M 8.34 Module: Engineering Mechanics [M-MACH-103205]

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

Organisation: KIT Department of Mechanical Engineering

Part of: Master Transfer Account

Credits	Language	Level	Version
5	German	4	3

Election block: Technische Mechanik (at least 5 credits)			
T-MACH-105209	Introduction into the Multi-Body Dynamics	5 CR	Seemann
T-MACH-105274	Engineering Mechanics IV	5 CR	Seemann
T-MACH-110375	Mathematical Methods in Continuum Mechanics	4 CR	Böhlke
T-MACH-110376	Tutorial Mathematical Methods in Continuum Mechanics	0 CR	Böhlke

Competence Certificate
A performance assessment is obligatory and can be oral, a written exam, or of another kind.

Prerequisites
none

Content
see different bricks

Workload
see different bricks

Learning type
Lecture, Tutorials, Lab Course, Consultation hours

M 8.35 Module: Engineering Mechanics [M-MACH-102402]

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

Organisation: KIT Department of Mechanical Engineering

Part of: Engineering Fundamentals

Credits	Language	Level	Version
18	German	2	1

Mandatory			
T-MACH-100282	Engineering Mechanics I	7 CR	Böhlke, Langhoff
T-MACH-100528	Tutorial Engineering Mechanics I	0 CR	Böhlke, Langhoff
T-MACH-100283	Engineering Mechanics II	6 CR	Böhlke, Langhoff
T-MACH-100284	Tutorial Engineering Mechanics II	0 CR	Böhlke, Langhoff
T-MACH-100299	Engineering Mechanics III	5 CR	Seemann
T-MACH-105202	Tutorial Engineering Mechanics III	0 CR	Seemann

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

exam-prerequisites EM III (see T-MACH-105202 "Engineering Mechanics III Tutorial).They consist of solving problems of the work sheets.

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

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

Competence Goal
After finishing the students can

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

In this lecture and tutorial students learn how to describe models of systems for a plain motion. They realize how to calculate speed and acceleration. The derivation of equations of motion for systems of particles and rigid bodies can be done. The students know the dependence of the kinetic energy on the kinetic quantities and the inertia parameters of the system and can apply the principle of work or the principle of the conservation of mechanical energy for conservative systems.

Prerequisites
None

Content
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

Engineering Mechanics II:• bending• shear• torsion• stress and strain state in 3D• Hooke's law in 3D• elasticity theors in 3D• energy methods in elastostatics• approximation methods• stability• inelastic material behaviour

Engineering Mechanics III:

Kinematics:Cartesian, cylindrical and natural coordinates. Time derivatives in moving reference frames, angular velocities of reference frames.Kinetics of a particle:Newton's axiom, Principle of d'Alembert, work of a force, kinetic and potential energies, principle of linear momentum, principle of moment of momentum, kinetics in moving reference systemsSystems of particles:Principle of center of mass, Principle of moment of momentum, impacts between particles, systems with variable mass, applications.Plain motion of rigid bodies:Pure translation, pure rotation, general plain motion. Instantaneous center of rotation, Kinetics, moment of momentum, principle of work and principle of energy conservation for a rotation around a space-fixed axis. Mass moment of inertia, parallel-axis-theorem.Principle of linear momentum and principle of moment of momentum for arbitrary plain motion. Principle of d'Alembert for plain motion. Principles of linear and moment of momentum in integral form. Applications for impact problems.

Workload
regular attendance: 150,5 Stunden
self-study: 389,5 Stunden

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

M 8.36 Module: Engineering Mechanics IV (5) [M-MACH-102831]

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

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
5	German	3	1

Mandatory			
T-MACH-105274	Engineering Mechanics IV	5 CR	Seemann

Competence Certificate
written exam

Competence Goal
The students know some possibilities to describe the position and orientation of a rigid body for an arbitrary 3D motion. They realize that the rotational velocity is a vector which may change both magnitude and orientation. They can apply the principle of linear momentum and the principle of moment of momentum to a spatial motion of a rigid body and notice that this is much more complicated compared to a plain motion. The students can calculate the coordinates of the inertia tensor. They see that many effects which may be seen with gyroscopes can be explained by the principle of moment of momentum. For systems with many particles or bodies but only few degrees of freedom the students know that the application of analytical methods like the principle of D'Alembert in Lagrangian form or the Lagrange equations may be advantageous. They can apply these principles to simple problems. For vibration problems the students can interprete the most important expressions like eigenfrequency, resonance or eigenvalue problem. Forced vibration of systems with one degree of freedom can be investigated by the students.

Prerequisites
None

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

Workload
time of attendance: 40h; self-study: 110h

Learning type
Lecture

M 8.37 Module: Fluid Mechanics (BSc-Modul 12, SL) [M-MACH-102565]

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

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 2: Maschinenbau)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Duration	Language	Level	Version
8	2 term	German/English	3	1

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

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

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

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

Module grade calculation
result of exam

Prerequisites
none

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

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

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

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

Workload
regular attendance: 64 hoursself-study: 176 hours

Learning type
Lectures + tutorials

Literature

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

Kuhlmann, H.: Strömungsmechanik, Pearson Studium

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

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

8.38 Module: Fundamentals of Energy Technology [M-MACH-102690]

Responsible: Dr. Aurelian Florin Badea
Prof. Dr.-Ing. Xu Cheng

Organisation: KIT Department of Mechanical Engineering

Part of: Master Transfer Account

Credits	Language	Level	Version
8	German	4	1

Mandatory			
T-MACH-105220	Fundamentals of Energy Technology	8 CR	Badea, Cheng

Competence Certificate
A performance assessment is obligatory and can be oral, a written exam, or of another kind.

Competence Goal
Maschinenbauingenieure mit Vertiefungsrichtung Energie und Umwelt zu vermitteln.

The students will receive state of the art knowledge about the very challenging field of energy industry and the permanent competition between the economical profitability and the long-term sustainability.

Prerequisites
none

Content
The following relevant fields of the energy industry are covered:
- Energy forms
- Thermodynamics relevant to energy industry
- Energy sources: fossil fuels, nuclear energy, renewable sources
- Energy industry in Germany, Europe and worldwide
- Power generation and environment
- Evaluation of energy conversion processes
- Thermal/electrical power plants and processes
- Transport of energy / energy carriers
- Energy storage
- Systems utilizing renewable energy sources
- Basics of economic efficiency and calculus / Optimisation
- Future of the energy industry

Workload
lectures: 45 h

preparation to exam: 195 h

8.39 Module: Fundamentals on High Frequency Techniques [M-ETIT-102129]

Responsible: Prof. Dr.-Ing. Thomas Zwick
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 1: Elektrotechnik und Informationstechnik)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
6	German	3	4

Mandatory			
T-ETIT-101955	Fundamentals on High Frequency Techniques	6 CR	Zwick

Prerequisites
None

M 8.40 Module: Further Examinations [M-MACH-104332]

Organisation: KIT Department of Mechanical Engineering
Part of: Additional Examinations

Credits	Language	Level	Version
30	German	3	1

Election block: Weitere Leistungen (at most 30 credits)			
T-MACH-106638	Wildcard Additional Examinations 1	3 CR	
T-MACH-106639	Wildcard Additional Examinations 2	3 CR	
T-MACH-106640	Wildcard Additional Examinations 3	3 CR	
T-MACH-106641	Wildcard Additional Examinations 4	3 CR	
T-MACH-106643	Wildcard Additional Examinations 5	3 CR	
T-MACH-106646	Wildcard Additional Examinations 6	3 CR	
T-MACH-106647	Wildcard Additional Examinations 7	3 CR	
T-MACH-106648	Wildcard Additional Examinations 8	3 CR	
T-MACH-106649	Wildcard Additional Examinations 9	3 CR	
T-MACH-106650	Wildcard Additional Examinations 10	3 CR	

Prerequisites
None

M 8.41 Module: Human Computer Interaction (24659) [M-INFO-100729]

Responsible: Prof. Dr.-Ing. Michael Beigl
Organisation: KIT Department of Informatics
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	3	1

Mandatory			
T-INFO-101266	Human-Machine-Interaction	6 CR	Beigl
T-INFO-106257	Human-Machine-Interaction Pass	0 CR	Beigl

M 8.42 Module: Human-Machine-Interaction in Anthropomatics: Basics (24100) [M-INFO-100824]

Responsible: Prof. Dr.-Ing. Jürgen Beyerer
Dr. Jürgen Geisler

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Language	Level	Version
3	Each winter term	1 term	German	3	1

Mandatory			
T-INFO-101361	Human-Machine-Interaction in Anthropomatics: Basics	3 CR	Beyerer, Geisler

M 8.43 Module: Hybrid and Electric Vehicles [M-ETIT-100514]

Responsible: Dr.-Ing. Klaus-Peter Becker

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 1: Elektrotechnik und Informationstechnik)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)
Master Transfer Account

Credits	Duration	Language	Level	Version
4	1 term	German	4	1

Mandatory			
T-ETIT-100784	Hybrid and Electric Vehicles	4 CR	Becker

Prerequisites
none

M 8.44 Module: Information Processing in Sensor Networks [M-INFO-100895]

Responsible: Prof. Dr.-Ing. Uwe Hanebeck
Organisation: KIT Department of Informatics
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Language	Level	Version
6	Each summer term	German	3	1

Mandatory			
T-INFO-101466	Information Processing in Sensor Networks	6 CR	Hanebeck

8.45 Module: information technology [M-ETIT-104539]

Responsible: Prof. Dr.-Ing. Eric Sax
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Engineering Fundamentals

Credits	Language	Level	Version
6	German	2	1

Mandatory			
T-ETIT-109300	Information Technology I	4 CR	Sax
T-ETIT-109301	Information Technology I - Practical Course	2 CR	Sax

Prerequisites
None

M 8.46 Module: Information Technology II and Automation Technology [M-ETIT-104547]

Responsible: Prof. Dr.-Ing. Eric Sax
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 1: Elektrotechnik und Informationstechnik)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
4	German	3	1

Mandatory			
T-ETIT-109319	Information Technology II and Automation Technology	4 CR	Sax

Prerequisites
None

M 8.47 Module: Internship [M-MACH-104265]

Responsible: Prof. Dr. Martin Doppelbauer
Prof. Dr.-Ing. Peter Gratzfeld

Organisation: KIT Department of Mechanical Engineering

Part of: Internship

Credits	Language	Level	Version
15	German	3	1

Mandatory			
T-MACH-108803	Internship	15 CR	Doppelbauer, Gratzfeld

Competence Certificate

An internship of at least thirteen weeks has to be fulfilled, which is suitable to provide the student an insight into the professionell work in the area of mechatronics and information technology. 15 ECTS are allocated to the intership.

Original certificates and reports about the internship has to be provided to the appropriate internship office.

The reports have to contain a compilation of activities during the internship with the following content:
company, area of production, workshop or department, instruction period in each workshop or department with start and end date and one detailed report per week or project. The report hast to consist of at least one DIN A4 page per week and should have the format of a scientific report. The reports should give evidence, that the author has done all reported activities by himself, for example by describing the work flow or reflecting the gained experience. Sketches, drawings, schematics etc. can save a long report.

The reports have to be checked by the supervisor in the company and have to be approved by stamp and signature. Periods which are not verified by a report cannot be accredited.

Competence Goal

The aim of the intership is, that the student will be lead to the typical activities of an engineer by contributing to specific technical tasks. He/she shall acquire knowhow related to his/her discipline and collect further impressions about his/her later professional enviroment and his/her position and responibility within a company. As far as possible he/she shoukd also get insights into organization and managment of a company.

Prerequisites

None

Content

It is recommended, to select one out of the following fields with respect of the intended area of specialization in the master course:

1. calculation, simulation, development and design
2. production and assembly (planning, preparation, controlling, calculation) of units, assembly parts, devices, apparats, tools, machines of the entire mechatronics
3. planning of measurements, measurement and testing technology, quality control
4. planning, planning of service, maintenance and repair
5. assembly and commissioning, tools and jig manufacturing
6. heat treatment and surface engineering
7. operation and maintenance (field support) of complete sites of mechatronics (power plants, switchboard plants, grids, drives, equipment of information and data systems technology, high frequency equipment, equipment of measurement, control, process technology and so on)
8. research laboratories
9. test areas and proving grounds, planning of assembly/deassembly
10. computing centers and software engineering

Annotation

Further information are provided by the internship guidlines for the BSc-course in Mechatronics and Information Technology.

Workload

450 hours

Learning type
Internship

M 8.48 Module: Introduction to Microsystem Technology I [M-MACH-102691]

Responsible: Prof. Dr. Andreas Guber
Organisation: KIT Department of Mechanical Engineering

Part of: Master Transfer Account

Credits	Language	Level	Version
4	German	4	1

Mandatory			
T-MACH-105182	Introduction to Microsystem Technology I	4 CR	Badilita, Jouda, Korvink

Competence Certificate
A performance assessment is obligatory and can be oral, a written exam, or of another kind.

Competence Goal
The lecture gives an introduction into the basics of microsystems technology. In analogy to processes employed in fabrication of microelectronics circuits the core technologies as well as materials for producing microstructures and components are presented. Finally, various techniques for Silicon micromachining are explained and illustrated with examples for micro-components and micro-systems.

Prerequisites
None

Content
- Introduction in Nano- and Microtechnologies
- Silicon and processes for fabricating microelectronics circuits
- Basic physics background and crystal structure
- Materials for micromachining
- Processing technologies for microfabrication
- Silicon micromachining
- Examples

Literature
M. Madou
Fundamentals of Microfabrication
Taylor & Francis Ltd.; Auflage: 3. Auflage. 2011

M 8.49 Module: Introduction to Microsystem Technology II [M-MACH-102706]

Responsible: Prof. Dr. Andreas Guber
Organisation: KIT Department of Mechanical Engineering

Part of: Master Transfer Account

Credits	Language	Level	Version
4	German	4	1

Mandatory			
T-MACH-105183	Introduction to Microsystem Technology II	4 CR	Jouda, Korvink

Competence Certificate
A performance assessment is obligatory and can be oral, a written exam, or of another kind.

Competence Goal
The lecture gives an introduction into the basics of microsystems technology. In the first part, methods for lithographic pattern transfer are summarized. Then specific techniques such as the LIGA process, micro-machining, and laser-patterning are explained and examples are given. Finally assembly and packaging methods are presented leading into a discussion of entire microsystems.

Prerequisites
none

Content
- Introduction in Nano- and Microtechnologies
- Lithography
- LIGA-technique
- Mechanical microfabrication
- Patterning with lasers
- Assembly and packaging
- Microsystems

Literature
M. Madou
Fundamentals of Microfabrication
Taylor & Francis Ltd.; Auflage: 3. Auflage. 2011

M 8.50 Module: Introduction to Operations Research (WW1OR) [M-WIWI-101418]

Responsible: Prof. Dr. Stefan Nickel
Prof. Dr. Steffen Rebennack
Prof. Dr. Oliver Stein

Organisation: KIT Department of Economics and Management

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Level	Version
9	Each summer term	2 semester	3	1

Mandatory			
T-WIWI-102758	Introduction to Operations Research I and II	9 CR	Nickel, Rebennack, Stein

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 July), one examination is held for both courses.

Competence Goal
The student

- names and describes basic notions of the essential topics in Operations Research (Linear programming, graphs and networks, integer and combinatorial optimization, nonlinear programming, dynamic programming and stochastic models),
- 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.

Module grade calculation
The overall grade of the module is the grade of the written examination.

Prerequisites
None

Content
This module treats the following topics: linear programming, network models, integer programming, nonlinear programming, dynamic programming, queuing theory, heuristic models.
This module forms the basis of a series of advanced lectures with a focus on both theoretical and practical aspects of Operations Research.

Workload
The total workload of the module is about 240 hours. The workload is proportional to the credit points of the individual courses.

M 8.51 Module: Introduction to Video Analysis (24684) [M-INFO-100736]

Responsible: Prof. Dr.-Ing. Jürgen Beyerer
Organisation: KIT Department of Informatics
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Language	Level	Version
3	Each summer term	1 term	German	3	1

Mandatory			
T-INFO-101273	Introduction to Video Analysis	3 CR	Beyerer

M 8.52 Module: Lab Course Electrical Drives and Power Electronics [M-ETIT-100401]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Duration	Language	Level	Version
6	1 term	German	4	1

Mandatory			
T-ETIT-100718	Lab Course Electrical Drives and Power Electronics	6 CR	Becker

Prerequisites
none

M 8.53 Module: Lab Course Electrical Power Engineering [M-ETIT-100419]

Responsible: Dr.-Ing. Rainer Badent
Dr.-Ing. Klaus-Peter Becker

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Master Transfer Account

Credits	Duration	Language	Level	Version
6	1 term	German	4	1

Mandatory			
T-ETIT-100728	Lab Course Electrical Power Engineering	6 CR	Badent, Becker

Prerequisites
none

M 8.54 Module: Laboratory Adaptive Sensor Electronics [M-ETIT-100469]

Responsible: Prof. Dr. Michael Siegel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Duration	Language	Level	Version
6	1 term	German	3	1

Mandatory			
T-ETIT-100758	Laboratory Adaptive Sensor Electronics	6 CR	Siegel

Prerequisites
none

M 8.55 Module: Laboratory Biomedical Engineering [M-ETIT-100389]

Responsible: Prof. Dr. Werner Nahm
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Duration	Language	Level	Version
6	1 term	German	4	2

Mandatory			
T-ETIT-101934	Laboratory Biomedical Engineering	6 CR	Nahm

Prerequisites
Passed exam of the module "Biomedizinische Messtechnik I".

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-ETIT-100387 - Biomedical Measurement Techniques I must have been passed.

M 8.56 Module: Laboratory Circuit Design [M-ETIT-100518]

Responsible: Prof. Dr.-Ing. Jürgen Becker
Dr.-Ing. Oliver Sander

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Duration	Language	Level	Version
6	1 term	German	3	1

Mandatory			
T-ETIT-100788	Laboratory Circuit Design	6 CR	Becker, Sander

Prerequisites
none

8.57 Module: Laboratory for Applied Machine Learning Algorithms [M-ETIT-104823]

Responsible: Prof. Dr.-Ing. Jürgen Becker
Prof. Dr.-Ing. Eric Sax
Prof. Dr. Wilhelm Stork

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
6	German	3	1

Mandatory			
T-ETIT-109839	Laboratory for Applied Machine Learning Algorithms	6 CR	Becker, Sax, Stork

8.58 Module: Laboratory Hardware and Software in Power Electronic Systems [M-ETIT-103263]

Responsible: Prof. Dr.-Ing. Marc Hiller
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
6	German	3	1

Mandatory			
T-ETIT-106498	Laboratory Hardware and Software in Power Electronic Systems	6 CR	Hiller

Prerequisites
The moduls "M-ETIT-100402 - Workshop Schaltungstechnik in der Leistungselektronik" and "M-ETIT-100404 - Workshop Mikrocontroller in der Leistungselektronik" may neither be started nor completed.

M 8.59 Module: Laboratory Mechatronic Measurement Systems [M-ETIT-103448]

Responsible: Prof. Dr.-Ing. Michael Heizmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Language	Level	Version
6	German	4	1

Mandatory			
T-ETIT-106854	Laboratory Mechatronic Measurement Systems	6 CR	Heizmann

Prerequisites
none

M 8.60 Module: Linear Electric Circuits [M-ETIT-104519]

Responsible: Prof. Dr. Olaf Dössel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Engineering Fundamentals

Credits	Language	Level	Version
9	German	1	2

Mandatory			
T-ETIT-109316	Linear Electronic Networks	7 CR	Dössel
T-ETIT-109317	Linear Electronic Networks - Workshop A	1 CR	Leibfried, Lemmer
T-ETIT-109811	Linear Electronic Networks - Workshop B	1 CR	Dössel

M 8.61 Module: Machine Tools and Industrial Handling (WW4INGMB32) [M-MACH-101286]

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

Part of: Master Transfer Account

Credits	Recurrence	Duration	Language	Level	Version
9	Each winter term	1 semester	German	4	3

Mandatory			
T-MACH-102158	Machine Tools and Industrial Handling	9 CR	Fleischer

Competence Certificate
Written exam (120 minutes)

Competence Goal
The students

- are able to assess the use and application of machine tools and handling equipment and to differentiate between them in terms of their characteristics and design
- can describe and discuss the essential elements of the machine tool (frame, main spindle, feed axes, peripheral equipment, control unit)
- are able to select and dimension the essential components of a machine tool
- are capable of selecting and evaluating machine tools according to technical and economic criteria.

Prerequisites
None

Content
The module overviews the construction, use and application of machine tools and industrial handling equipment. A well-founded and practice-oriented knowledge is imparted about the selection, design and evaluation of machine tools. First, the main components of the machine tools are systematically explained and their design principles as well as the integral machine tool design are discussed. Subsequently, the use and application of machine tools will be demonstrated using typical machine examples. Based on examples from current research and industrial applications, the latest developments are discussed, especially concerning the implementation of Industry 4.0.

The individual topics are:

- Frames and frame components
- Feed axes
- Spindles
- Peripheral equipment
- Control unit
- Metrological evaluation and machine testing
- Process monitoring
- Maintenance of machine tools
- Safety assessment of machine tools
- Machine examples

Workload
regular attendance: 63 hours
self-study: 207 hours

Learning type
Lecture, exercise, excursio

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

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

Organisation: KIT Department of Mechanical Engineering

Part of: Engineering Fundamentals

Credits	Language	Level	Version
4	German	1	1

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

Competence Certificate
written exam (duration: 60 min)

Competence Goal
The students ...

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

Prerequisites
none

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

The following topics will be covered:

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

Workload
regular attendance: 21 hoursself-study: 99 hours

Learning type
Lecture

M 8.63 Module: Material Science and Engineering (CIW-MACH-01) [M-MACH-102567]

Responsible: Dr.-Ing. Johannes Schneider
Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 2: Maschinenbau)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Language	Level	Version
9	Each winter term	2 term	German	3	1

Mandatory			
T-MACH-105148	Examination Material Science I & II	9 CR	Schneider

Competence Certificate
oral exam

Competence Goal
The students are able to describe the relationship between atomic structure, microscopical observations, and properties of solid materials.

The students can describe the typical property profiles and can name applications for the most important engineering materials.

The students are able to describe standard materials characterization methods and can explain the evaluation of these methods. They can judge materials on base of the data obtained by these methods.

The students are able to describe the basic mechanisms of hardening for ferrous and non-ferrous materials and reflect these mechanisms using phase and TTT diagrams.

The students can interpret given phase, TTT or other diagrams relevant for materials science, gather information from them and can correlate them regarding the microstructure evolution.

The students can describe the phenomena correlated with materials science in polymers, metals and ceramics and depict differences.

The students know about standard materials characterization methods and are able to asses materials on base of the data obtained by these methods.

Module grade calculation
grade of the oral exam

Prerequisites
None

Content
Atomic structure and atomic bonds

Structures of crystalline and amorphous solids

Defects in crystalline solids

Alloys

Transport and transformation phenomena in the solid state
Corrosion

Wear

Mechanical properties
Testing of materials
Ferrous materials

Non-ferrous metals and alloys

Polymers

Engineering ceramics
Composites

Workload
regular attendance: 90 hours
self-study: 180 hours

Learning type
lectures and exercices

Literature
W. Bergmann: Werkstofftechnik I + II, Hanser Verlag, München, 2008/9
M. Merkel: Taschenbuch der Werkstoffe, Hanser Verlag, München, 2008
R. Schwab: Werkstoffkunde und Werkstoffprüfung für Dummies, Wiley VCH, Weinheim, 2011
J.F. Shackelford; Werkstofftechnologie für Ingenieure, Pearson Studium, München, 2008 (E-Book)
J.F. Shackelford,: Introduction to Materials Science for Engineers. Prentice Hall, 2008
lecture notes and lab script

M 8.64 Module: Materials [M-ETIT-102734]

Responsible: Prof. Dr. Martin Doppelbauer
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Language	Level	Version
5	German	4	2

Election block: Werkstoffe (1 item)			
T-MACH-100531	Systematic Materials Selection	5 CR	Dietrich
T-ETIT-100292	Passive Components	5 CR	Menesklou, Wagner
T-MACH-105535	Composite Manufacturing - Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies	4 CR	Henning

Prerequisites
none

Annotation
The three parts of the module "M-ETIT-102734 - Materials" are mutually exclusive

M 8.65 Module: Mechanical Design (CIW-MACH-02) [M-MACH-101299]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: Engineering Fundamentals

Credits	Language	Level	Version
8	German	1	3

Mandatory			
T-MACH-110363	Mechanical Design Basics I and II	6 CR	Albers, Matthiesen
T-MACH-110364	Mechanical Design Basics I, Tutorial	1 CR	Albers, Matthiesen
T-MACH-110365	Mechanical Design Basics II, Tutorial	1 CR	Albers, Matthiesen

Competence Certificate

Written examination on the contents of Mechanical Design I&II

Duration: 90 min plus reading time

Preliminary examination: Successful participation in the preliminary work in the field of Mechanical Design I&II

Competence Goal
Learning object springs:

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

Learning objects Technical Systems:

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

Learning objects Visualization:

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

Learning objects Bearings:

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

Learning objectives seals:

The students...

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

Learning design:

The students...

- understand the meaning of design
- are able to recognize and implement basic rules and principles of design
- are able to design the connection of partial systems into the total system
- can name requirements of design and take them into account
- know the main groups of manufacturing methods

- are able to explain the manufacturing processes
- are able to depict a casted design in a drawing clearly, e.g. draft of the mold, no material accumulation, ...
- know how components are designed
- Know how the production of the components has an effect on
- their design
- Know the requirements and boundary conditions on design

Learning bolted connections:

The students...

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

Prerequisites

None

Content

MKL I:

Introduction to product development

Tools for visualization (technical drawing)

Product creation as a problem solution

Technical Systems Product Development

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

Basics of selected construction and machine elements

- Federn
- bearings and fence
- sealings

The lecture is accompanied by exercises with the following content:

gear workshop

Tools for visualization (technical drawing)

Technical Systems Product Development

- Systemtheorie
- Contact amd Channel Approach C&C²-A

Exercises for springs

Exercises for bearings and fence

MKL II:

- sealings
- design
- dimensioning
- component connections
- bolts

Workload

MKL1:

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

Presence exercises (8 exercises): 12h

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

Preparation and execution of online test: 6h

Personal preparation and follow-up of lecture and exercise: 34,5h MKL1:

MKL2:

Attendance lectures (15 VL): 22,5h

Presence exercises (7 ÜB): 10,5h

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

Learning type

Lecture

Tutorial

Project work during the semester

Online-test

8.66 Module: Mechanical Design III+IV (13 LP) [M-MACH-102829]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 2: Maschinenbau)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
13	German	3	2

Mandatory			
T-MACH-104810	Mechanical Design III & IV	13 CR	Albers, Burkardt, Matthiesen
T-MACH-105284	Mechanical Design III, Constructing the Team	0 CR	Albers, Matthiesen
T-MACH-105285	Mechanical Design IV, Constructing the Team	0 CR	Albers, Matthiesen

Competence Certificate
Written examination, consisting of theoretical and constructive part.
The theoretical examination lasts 1 hour plus reading time
The constructional examination takes 3 hours plus reading time.
Both parts of the examination must be passed in order to pass the overall examination for machine design apprenticeship III+IV.

Competence Goal

Learning objectives tolerances and fits:

The students...

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

Learning objectives component connections:

The students...

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

Learning objectives gears:

The students...

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

Learning objects dimensioning

Students can...

- Explain the target values of the economic dimensioning
- explain what are the main results of a dimensioning process
- explain the scope of the dimensioning (economic and legal significance)
- Explain the basic sizing procedure and record it as a generic flowchart
- Explain uncertainties in dimensioning
- specify the different basic procedures, both for dimensioning and for determining the influencing variables, e.g. loads, as well as their advantages or disadvantages in relation to each other
- explain different types of calculation methods and their characteristics (static/dynamic, local vs. nominal voltages)
- Name different types of failure (implies the definition of failure)
- Explain possible causes of failure
- provide suitable replacement models for simple subsystems of technical systems as a basis for dimensioning
- Explain different basic load types for given examples Dominant load types relevant to design
- Use the basics of elastostatics for all basic load cases to design components that can be modeled as linear structures according to the nominal stress concept.
- describe the dimensioning parameters presented in the VL and their use (shape number, shape yield strength, shape yield strength ratio)
- explain the purpose of strength hypotheses
- explain the strength hypotheses for metallic materials presented in the VL and select them according to the specific situation
- explain the principal effects of notches, including the factors affecting the magnitude of these effects
- describe how notches can be taken into account in the dimensioning process
- notched components that can be modeled as linear load-bearing structures for static loads
- Explain possibilities for determining the strength of a material or component
- Name influencing variables on the loadability and derive measures from them in order to influence the loadability of a component if necessary.
- describe different types of material behaviour under overelastic stressing of metallic materials
- Describe dynamic loads
- from Wöhler, Haigh- or Smith diagrams determine material characteristics for the loadability under given load conditions
- construct the Smith chart approximately with the given characteristic values

- explain the difference between strength and fatigue strength
- Components that can be modeled as linear structures according to the nominal stress concept for dynamic loads in base load cases and combined loads in the same phase
- for components that can be modeled as linear structures, explain the design approach presented in the lecture for any combined, dynamic loads
- Perform strength analyses in accordance with DIN 743, in the course of which even failure-critical points in the component can be identified and, if the result is negative, appropriate measures can be derived and evaluated.
- Name factors influencing the safety factors to be selected and explain what type of influence this is

Learning objectives shaft couplings:

Students can...

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

Learning Objectives Fundamentals of Fluid Technology:

Students can...

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

Prerequisites
None

Content
tolerances and fits

component connections

gears

Basics of component dimensioning
shaft clutches
Fundamentals of Fluid Power

Workload

MKL 3:

Attendance lectures (15 L): 22,5h

Presence exercises (4 exercises): 6h

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

Project work in a team: 80h

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

MKL 4:

Attendance lectures (13 L): 19,5h

Presence exercises (6 exercises): 9h

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

Project work in a team: 120h

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

Learning type

Lecture

Tutorial

Project work during the semester

M 8.67 Module: Mechano-Informatics and Robotics [M-INFO-100757]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Organisation: KIT Department of Informatics
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Language	Level	Version
4	Each winter term	1 term	German/English	3	1

Mandatory			
T-INFO-101294	Mechano-Informatics and Robotics	4 CR	Asfour

Competence Goal
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.

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 statespace as well as non-linear systems described as a set of differential equations which are driven by canonical systems. Further topics include perception, exploration, and classification of objects using haptics, and the basics as well as advanced applications of (deep) neural networks. Applications and approaches are presented which address current problems in robotics such as grasping, walking, visual and tactile visual servoing, and the classification of actions.

Recommendation
Siehe Teilleistung.

M 8.68 Module: Mechatronical Systems and Products [M-MACH-102749]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: Engineering Fundamentals

Credits	Language	Level	Version
6	German	3	1

Mandatory			
T-MACH-105574	Mechatronical Systems and Products	3 CR	Hohmann, Matthiesen
T-MACH-108680	Workshop Mechatronical Systems and Products	3 CR	Albers, Hohmann, Matthiesen

Competence Certificate
Success is monitored within the framework of an written examination (60 minutes) and an alternative academic achievement

Competence Goal
The students

- are able to describe the difficulties of interdisciplinary projects.
- are able to coordinate processes, structures, responsibilities and interfaces within a project
- know different solutions for mechanic/electric problems
- know the elements of the treated product development processes, are able to describe different views onto them and execute them
- know the model based systems engineering approaches
- know the basic principles of virtual design and are able to apply the methods of virtual system design
- are able to identify the differences between virtuality and reality
- are able to recognize the advantages of early validation
- Students are able to understand and apply model description with Bond graphs and generalized system elements
- Students are able to synthesize and analyze multi-domain models
- Students are able to apply parameter identification methods

Module grade calculation
The module grade is composed in equal parts of the grades of the module's sub-services.

Prerequisites
None

Content
The lecture provides the theoretic basics, which will be applied and enhanced in development project during the semester. The project will take part in small groups, where the students have to organize and distribute the tasks on their own. In the project work - the workshop Mechatronic Systems and Products - they work on a development task in teams. This involves various development phases, from the development of technical solution concepts to the development and validation of virtual prototypes and physical functional prototypes.

Recommendation
It is recommended not to take this module with other time-consuming workshops, such as MD, at the same time.

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
180 h, thereof 57 h attendance time, 123 h self-study and exam preparation

Learning type
Lecture, exercise and project work

Literature
Janschek, Klaus (2010): Systementwurf mechatronischer Systeme. Methoden - Modelle - Konzepte. Berlin, Heidelberg: Springer.

Weilkiens, Tim (2008): Systems engineering mit SysML/UML. Modellierung, Analyse, Design. 2., aktualisierte u. erw. Aufl. Heidelberg: Dpunkt-Verl.

M 8.69 Module: Medical Imaging Techniques I [M-ETIT-100384]

Responsible: Prof. Dr. Olaf Dössel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)
Master Transfer Account

Credits	Duration	Language	Level	Version
3	1 term	German	4	1

Mandatory			
T-ETIT-101930	Medical Imaging Techniques I	3 CR	Dössel

Prerequisites
none

M 8.70 Module: Metrology in Mechatronics [M-ETIT-103242]

Responsible: Prof. Dr.-Ing. Michael Heizmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Language	Level	Version
5	German	4	1

Mandatory			
T-ETIT-106432	Metrology in Mechatronics	5 CR	Heizmann

Prerequisites
none

8.71 Module: Microactuators [M-MACH-100487]

Responsible: Prof. Dr. Manfred Kohl
Organisation: KIT Department of Mechanical Engineering

Part of: Master Transfer Account

Credits	Recurrence	Language	Level	Version
4	Once	German	4	1

Mandatory			
T-MACH-101910	Microactuators	4 CR	Kohl

Competence Certificate
A performance assessment is obligatory and can be oral, a written exam, or of another kind.

Competence Goal
- Knowledge of the actuation principles including pros and cons
- Knowledge of important fabrication technologies
- Explanation of layout and function of the microactuators
- Calculation of important properties (time constants, forces, displacements, etc.)
- Development of a layout based on specifications

Prerequisites
none

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:

- Microelectromechnical 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

Workload
lecture time 1.5 h/week

self preparation: 8.5 h/week

Literature
- Lecture notes

- 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, Cambride University Press 2010

M 8.72 Module: Microwave Laboratory I [M-ETIT-100425]

Responsible: Prof. Dr.-Ing. Thomas Zwick
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
6	English	3	1

Mandatory			
T-ETIT-100734	Microwave Laboratory I	6 CR	Zwick

Prerequisites
none

M 8.73 Module: Mobile Computing and Internet of Things (IN3INMC) [M-INFO-101249]

Responsible: Prof. Dr.-Ing. Michael Beigl
Organisation: KIT Department of Informatics
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Language	Level	Version
5	Each winter term	1 semester	German	3	1

Mandatory			
T-INFO-102061	Mobile Computing and Internet of Things	5 CR	Beigl

Prerequisites
None

M 8.74 Module: Motor Vehicle Laboratory [M-MACH-102695]

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

Part of: Master Transfer Account

Credits	Language	Level	Version
4	German	4	1

Mandatory			
T-MACH-105222	Motor Vehicle Labor	4 CR	Frey

Competence Certificate
After completion of the experiments: written examination
Duration: 90 minutes

Auxiliary means: none

Competence Goal
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.

Prerequisites
None

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

Annotation
The admission is limited to 12 persons per group.

Workload
regular attendance: 31,5 hours
self-study: 103,5 hours

Literature
1. Matschinsky, W: Radführungen der Straßenfahrzeuge, Verlag TÜV Rheinland, 1998

2. Reimpell, J.: Fahrwerktechnik: Fahrzeugmechanik, Vogel Verlag, 1992

3. Gnadler, R.: Documents to the Motor Vehicle Laboratory

M 8.75 Module: Nonlinear Model Predictive Control - Theory and Applications [M-INFO-103705]

Responsible: Dr. Timm Faulwasser
Organisation: KIT Department of Informatics
Part of: Master Transfer Account

Credits	Language	Level	Version
5	English	4	2

Mandatory			
T-INFO-107492	Nonlinear Model Predictive Control - Theory and Applications	5 CR	Faulwasser

M 8.76 Module: Numerical Methods [M-MATH-100536]

Responsible: Prof. Dr. Wolfgang Reichel
Organisation: KIT Department of Mathematics
Part of: Master Transfer Account

Credits	Recurrence	Level	Version
5	Once	4	1

Mandatory			
T-MATH-100803	Numerical Methods - Exam	5 CR	Kunstmann, Plum, Reichel

Prerequisites
none

M 8.77 Module: Optics and Solid State Electronics [M-ETIT-104067]

Responsible: Prof. Dr. Ulrich Lemmer
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
8	German	3	1

Mandatory			
T-ETIT-109444	Optics and Solid State Electronics	8 CR	

Prerequisites
None

M 8.78 Module: Optoelectronic Components [M-ETIT-100509]

Responsible: Prof. Dr. Wolfgang Freude
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
4	English	3	1

Mandatory			
T-ETIT-101907	Optoelectronic Components	4 CR	Freude

Competence Goal

Comprehending the physical layer of optical communication systems. Developing a basic understanding which enables a designer to read a device´s data sheet, to make most of its properties, and to avoid hitting its limitations.

The students

- understand the components of the physical layer of optical communication systems
- acquire the knowledge of operation principles and impairments of optical waveguides
- know the basics of laser diodes, luminescence diodes and semiconductor optical amplifiers
- understand pin-photodiodes
- know the systems´sesitivity limits, which are caused by optical and electrical noise

Prerequisites

none

Content

The course concentrates on the most basic optical communication components. Emphasis is on physical understanding, exploiting results from electromagnetic field theory, (light waveguides), solid-state physics (laser diodes, LED, and photodiodes), and communication theory (receivers, noise). The following components are discussed:

- Light waveguides: Wave propagation, slab waveguides, strip wave-guides, integrated optical waveguides, fibre waveguides
- Light sources and amplifiers: Luminescence and laser radiation, luminescent diodes, laser diodes, stationary and dynamic behavior, semiconductor optical amplifiers
- Receivers: pin photodiodes, electronic amplifiers, noise

Literature

Detailed textbook-style lecture notes as well as the presentation slides can be downloaded from the IPQ lecture pages.

Agrawal, G.P.: Lightwave technology. Hoboken: John Wiley & Sons 2004

Iizuka, K.: Elements of photonics. Vol. I, especially Vol. II. Hoboken: John Wiley & Sons 2002

Further textbooks in German (also in electronic form) can be named on request.

M 8.79 Module: Optoelectronics [M-ETIT-100480]

Responsible: Prof. Dr. Ulrich Lemmer
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Duration	Language	Level	Version
4	1 term	German	3	1

Mandatory			
T-ETIT-100767	Optoelectronics	4 CR	Lemmer

Prerequisites
none

M 8.80 Module: Organ Support Systems [M-MACH-102702]

Responsible: Prof. Dr. Christian Pylatiuk
Organisation: KIT Department of Mechanical Engineering

Part of: Master Transfer Account

Credits	Language	Level	Version
4	German	4	1

Mandatory			
T-MACH-105228	Organ Support Systems	4 CR	Pylatiuk

Competence Certificate
A performance assessment is obligatory and can be oral, a written exam, or of another kind.

Competence Goal
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.

Prerequisites
none

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.

Workload
General attendance: 21 h

Self-study: 99 h

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.

M 8.81 Module: Orientation Exam [M-MACH-104333]

Organisation: University
Part of: Orientation Exam

Credits	Language	Level	Version
0	German	1	1

Mandatory			
T-MACH-100282	Engineering Mechanics I	7 CR	Böhlke, Langhoff
T-ETIT-109316	Linear Electronic Networks	7 CR	Dössel
T-ETIT-109317	Linear Electronic Networks - Workshop A	1 CR	Leibfried, Lemmer
T-ETIT-109811	Linear Electronic Networks - Workshop B	1 CR	Dössel

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

Prerequisites
None

M 8.82 Module: Photovoltaic System Design [M-ETIT-100411]

Responsible: Robin Grab
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Duration	Language	Level	Version
3	1 term	German	3	1

Mandatory			
T-ETIT-100724	Photovoltaic System Design	3 CR	Grab

Prerequisites
none

8.83 Module: Physiology and Anatomy for Engineers I [M-ETIT-100390]

Responsible: Prof. Dr. Olaf Dössel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
3	German	3	1

Mandatory			
T-ETIT-101932	Physiology and Anatomy for Engineers I	3 CR	Dössel

Prerequisites
none

M 8.84 Module: Power Electronics [M-ETIT-100533]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Duration	Language	Level	Version
5	1 term	German	4	2

Mandatory			
T-ETIT-100801	Power Electronics	5 CR	Becker

Prerequisites
None

M 8.85 Module: Power Generation [M-ETIT-100407]

Responsible: Dr.-Ing. Bernd Hoferer
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Duration	Language	Level	Version
3	1 term	German	3	1

Mandatory			
T-ETIT-101924	Power Generation	3 CR	Hoferer

Prerequisites
none

M 8.86 Module: Power Transmission and Power Network Control [M-ETIT-100534]

Responsible: Prof. Dr.-Ing. Thomas Leibfried
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Duration	Language	Level	Version
5	1 term	German	4	1

Mandatory			
T-ETIT-101941	Power Transmission and Power Network Control	5 CR	Leibfried

Prerequisites
none

M 8.87 Module: Practical Aspects of Electrical Drives [M-ETIT-100394]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Duration	Language	Level	Version
4	1 term	German	4	1

Mandatory			
T-ETIT-100711	Practical Aspects of Electrical Drives	4 CR	Becker

Prerequisites
none

8.88 Module: Practical Design of Control Systems [M-ETIT-103814]

Responsible: Prof. Dr.-Ing. Sören Hohmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 1: Elektrotechnik und Informationstechnik)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
6	German	3	2

Mandatory			
T-ETIT-107702	Practical Design of Control Systems	6 CR	Hohmann
T-ETIT-108117	Workshop Practical Design of Control Systems	0 CR	Hohmann

Prerequisites
The successful participation in the workshop is a prerequisite for admission to the examination.

Annotation
Attention: The successful participation in the workshop is a prerequisite for admission to the examination.

M 8.89 Module: Practical Project Robotics and Automation I (Software) [M-INFO-102224]

Responsible: Prof. Dr.-Ing. Björn Hein
Prof. Dr.-Ing. Torsten Kröger

Organisation: KIT Department of Informatics

Part of: Master Transfer Account

Credits	Recurrence	Language	Level	Version
6	Each term	German	4	1

Mandatory			
T-INFO-104545	Practical Project Robotics and Automation I (Software)	6 CR	Hein

8.90 Module: Practical Project Robotics and Automation II (Hardware) [M-INFO-102230]

Responsible: Prof. Dr.-Ing. Björn Hein
Prof. Dr.-Ing. Torsten Kröger

Organisation: KIT Department of Informatics

Part of: Master Transfer Account

Credits	Recurrence	Language	Level	Version
6	Each term	German	4	1

Mandatory			
T-INFO-104552	Practical Project Robotics and Automation II (Hardware)	6 CR	Hein

M 8.91 Module: Principles of Medicine for Engineers [M-MACH-102720]

Responsible: Prof. Dr. Christian Pylatiuk
Organisation: KIT Department of Mechanical Engineering

Part of: Master Transfer Account

Credits	Language	Level	Version
4	German	4	1

Mandatory			
T-MACH-105235	Principles of Medicine for Engineers	4 CR	Pylatiuk

Competence Certificate
A performance assessment is obligatory and can be oral, a written exam, or of another kind.

Competence Goal
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.

Prerequisites
none

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.

Workload
General attendance: 21 h

Self-study: 99 h

Literature

- Adolf Faller, Michael Schünke: Der Körper des Menschen. Thieme Verlag.
- Renate Huch, Klaus D. Jürgens: Mensch Körper Krankheit. Elsevier Verlag.

M 8.92 Module: Product Development - Methods of Product Development [M-MACH-102718]

Responsible: Prof. Dr.-Ing. Albert Albers
Norbert Burkardt
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: Master Transfer Account

Credits	Language	Level	Version
6	German/English	4	2

Mandatory			
T-MACH-109192	Methods and Processes of PGE - Product Generation Development	6 CR	Albers, Burkardt, Matthiesen

Competence Certificate
Written examination (processing time: 120 min + 10 min reading time)

Competence Goal
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 differents methods of design of experiment.
- explain the costs in development process.

Prerequisites
None

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

Workload
regular attendance: 31.5 h

self-study: 148.5 h

Learning type
Lecture

Tutorial

Literature
Lecture documents
Pahl, Beitz: Konstruktionslehre, Springer-Verlag 1997
Hering, Triemel, Blank: Qualitätssicherung für Ingenieure; VDI-Verlag, 1993

8.93 Module: Production Techniques Laboratory [M-MACH-102711]

Responsible: Prof. Dr.-Ing. Barbara Deml
Prof. Dr.-Ing. Kai Furmans
Prof. Dr.-Ing. Jivka Ovtcharova
Prof. Dr.-Ing. Volker Schulze

Organisation: KIT Department of Mechanical Engineering

Part of: Master Transfer Account

Credits	Language	Level	Version
4	German	4	2

Mandatory			
T-MACH-105346	Production Techniques Laboratory	4 CR	Deml, Fleischer, Furmans, Ovtcharova

Competence Certificate
A performance assessment (non-graded) is obligatory and can be oral, a written exam, or of another kind.

Competence Goal
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.

Prerequisites
None

Content
The production technique laboratory (PTL) is a collaboration of the institutes wbk, IFL, IMI and ifab.

1. Computer Aided Product Development (IMI)
2. Computer communication in factory (IMI)
3. Production of parts with CNC turning machines (wbk)
4. Controlling of production systems using PLCs (wbk)
5. Automated assembly systems (wbk)
6. Optical identification in production and logistics (IFL)
7. RFID identification systems (IFL)
8. Storage and order-picking systems (IFL)
9. Design of workstations (ifab)
10. Time study (ifab)
11. Accomplishment of workplace design (ifab)

Workload
Present time: 20 h

Self study: 100 h

Learning type
Seminar

Literature
Handout and literature online ILIAS.

M 8.94 Module: Programming (IN1INPROG) [M-INFO-101174]

Responsible: Prof. Dr.-Ing. Anne Koziolek
Prof. Dr. Ralf Reussner
Prof. Dr.-Ing. Gregor Snelting

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 semester	German	3	1

Mandatory			
T-INFO-101967	Programming Pass	0 CR	Koziolek, Reussner
T-INFO-101531	Programming	6 CR	Koziolek, Reussner

Competence Goal
Students should learn

- basic structures of the programming language Java and how to apply them; in particular control and simple data structures, object orientation and implementation of basic algorithms
- basics of programming methodology and the ability to autonomously write executable small to medium sized Java programs

Content

- objects and classes
- types, values and variables
- methods
- control structures
- recursion
- references, lists
- inheritance
- input and output
- exceptions
- programming methodology
- implementation of basic algorithms in Java (such as sorting algorithms)

M 8.95 Module: Project Management in the Development of Products for Safety-Critical Applications [M-ETIT-104475]

Responsible: Dr.-Ing. Manfred Nolle
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Language	Level	Version
4	German	4	1

Mandatory			
T-ETIT-109148	Project Management in the Development of Products for Safety-Critical Applications	4 CR	Nolle

M 8.96 Module: Radiation Protection [M-ETIT-100562]

Responsible: Prof. Dr. Olaf Dössel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
3	English	3	1

Mandatory			
T-ETIT-100825	Radiation Protection	3 CR	Dössel

Prerequisites
none

8.97 Module: Rail Vehicle Technology [M-MACH-102683]

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

Part of: Master Transfer Account

Credits	Language	Level	Version
4	German	4	2

Mandatory			
T-MACH-105353	Rail Vehicle Technology	4 CR	Gratzfeld

Competence Certificate
Oral exam

Duration: ca. 20 minutes

no tools or reference materials may be used during the exam.

Competence Goal

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

Prerequisites
none

Content

1. Vehicle system technology: structure and main systems of rail vehicles
2. Car body: functions, requirements, design principles, crash elements, interfaces
3. Bogies: forces, running gears, axle configuration
4. Drives: vehicle with/without contact wire, dual-mode vehicle
5. Brakes: tasks, basics, principles, blending, brake control
6. Train control management system: definitions, networks, bus systems, components, examples
7. Vehicle concepts: trams, metros, regional trains, intercity trains, high speed trains, double deck coaches, locomotives, freight wagons

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

Workload
Regular attendance: 21 hours

Self-study: 21 hours

Exam and preparation: 78 hours

Learning type
Lecture

M 8.98 Module: Real-Time Systems (24576) [M-INFO-100803]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Prof. Dr.-Ing. Björn Hein
Prof. Dr.-Ing. Thomas Längle

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	3	1

Mandatory			
T-INFO-101340	Real-Time Systems	6 CR	Asfour, Längle

M 8.99 Module: Robotics - Practical Course [M-INFO-102522]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Organisation: KIT Department of Informatics
Part of: Master Transfer Account

Credits	Recurrence	Language	Level	Version
6	Each summer term	German	4	2

Mandatory			
T-INFO-105107	Robotics - Practical Course	6 CR	Asfour

Competence Goal
The student knows concrete solutions for different problems in robotics. He/she uses methods of inverse kinematics, grasp and motion planning, and visual perception. The student can implement solutions in the programming language C++ with the help of suitable software frameworks.

Content
The practical course is offered as an accompanying course to the lectures Robotics I-III. Every week, a small team of students will work on solving a given robotics problem. The list of topics includes robot modeling and simulation, inverse kinematics, robot programming via statecharts, collision-free motion planning, grasp planning, and robot vision.

Recommendation
Should have attended the lectures Robotics I - III, and Mechano-Informatics and Robotics.

M 8.100 Module: Robotics I - Introduction to Robotics [M-INFO-100893]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Organisation: KIT Department of Informatics
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)
Master Transfer Account

Credits	Recurrence	Language	Level	Version
6	Each winter term	German	4	3

Mandatory			
T-INFO-108014	Robotics I - Introduction to Robotics	6 CR	Asfour

M 8.101 Module: Robotics II: Humanoid Robotics [M-INFO-102756]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Organisation: KIT Department of Informatics
Part of: Master Transfer Account

Credits	Recurrence	Language	Level	Version
3	Each summer term	German/English	4	2

Mandatory			
T-INFO-105723	Robotics II: Humanoid Robotics	3 CR	Asfour

Competence Goal
The students have an overview of current research topics in autonomous learning robot systems using the example of humanoid robotics. They are able to classify and evaluate current developments in the field of cognitive humanoid robotics.

The students know the essential problems of humanoid robotics and are able to develop solutions on the basis of existing research.

Prerequisites
None

Content
The lecture presents current work in the field of humanoid robotics that deals with the implementation of complex sensorimotor and cognitive abilities. In the individual topics different methods and algorithms, their advantages and disadvantages, as well as the current state of research are discussed.

The topics addressed are: biomechanical models of the human body, biologically inspired and data-driven methods of grasping, active perception, imitation learning and programming by demonstration as well as semantic representations of sensorimotor experience

8.102 Module: Robotics III - Sensors and Perception in Robotics (24635) [M-INFO-104897]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Organisation: KIT Department of Informatics
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)
Master Transfer Account

Credits	Recurrence	Duration	Language	Level	Version
3	Each summer term	1 term	German/English	4	1

Mandatory			
T-INFO-109931	Robotics III - Sensors and Perception in Robotics	3 CR	Asfour

Competence Goal
Students know the main sensor principles used in robotics and understand the data flow from physical measurement through digitization to the use of the recorded data for feature extraction, state estimation and environmental modeling.

Students are able to propose and justify suitable sensor concepts for common tasks in robotics.

Content
The lecture supplements the lecture Robotics I with a broad overview of sensors used in robotics. The lecture focuses on visual perception, object recognition, simultaneous localization and mapping (SLAM) and semantic scene interpretation. The lecture is divided into two parts:

In the first part a comprehensive overview of current sensor technologies is given. A basic 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 concentrates on the use of exteroceptive sensors in robotics. The topics covered include tactile exploration and visual data processing, including advanced topics such as feature extraction, object localization, simultaneous localization and mapping (SLAM) and semantic scene interpretation.

8.103 Module: Seminar Battery [M-ETIT-103037]

Responsible: Dr.-Ing. Andre Weber
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
3	German	3	1

Mandatory			
T-ETIT-106051	Seminar Battery	3 CR	Weber

Prerequisites
Participation is allowed in one out of these four modules only:

- M-ETIT-100522 - Seminar Battery Research
- M-ETIT-101852 - Seminar Battery Research I
- M-ETIT-101862 - Seminar Battery Research II
- M-ETIT-103037 - Seminar Battery

M 8.104 Module: Seminar on Selected Chapters of Biomedical Engineering [M-ETIT-100383]

Responsible: Dr.-Ing. Axel Loewe
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Duration	Language	Level	Version
3	1 term	German	3	1

Mandatory			
T-ETIT-100710	Seminar on Selected Chapters of Biomedical Engineering	3 CR	Loewe

Prerequisites
none

M 8.105 Module: Seminar Power Electronics in Regenerative Energy Systems [M-ETIT-100397]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Duration	Language	Level	Version
4	1 term	German	3	1

Mandatory			
T-ETIT-100714	Seminar Power Electronics in Regenerative Energy Systems	4 CR	Becker

Prerequisites
keine

M 8.106 Module: Sensors [M-ETIT-100378]

Responsible: Dr. Wolfgang Menesklou
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master Transfer Account

Credits	Duration	Language	Level	Version
3	1 term	German	4	1

Mandatory			
T-ETIT-101911	Sensors	3 CR	Menesklou

8.107 Module: Signals and Systems [M-ETIT-104525]

Responsible: Prof. Dr.-Ing. Fernando Puente León
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Engineering Fundamentals

Credits	Language	Level	Version
7	German	2	1

Mandatory			
T-ETIT-109313	Signals and Systems	6 CR	Puente León
T-ETIT-109314	Signals and Systems - Workshop	1 CR	Puente León

Prerequisites
none

M 8.108 Module: Soft Skills [M-MACH-104355]

Responsible: Prof. Dr.-Ing. Sven Matthiesen
Organisation: KIT Department of Mechanical Engineering

Part of: Interdisciplinary Qualifications

Credits	Language	Level	Version
2	German	3	1

Mandatory			
T-MACH-105699	Cooperation in interdisciplinary teams	2 CR	Matthiesen

Competence Certificate
Accompanying the workshop, delivery services are required. In these the application of the knowledge of the students is examined.

Competence Goal
The students:

- can describe the difficulties of interdisciplinary project work
- can coordinate processes, structures, areas of responsibility and interfaces within a project
- know the elements of the treated product development processes (PEP) and can explain the different views of a PEP

Prerequisites
None

Content
The students receive a semester-accompanying development task, which they must solve independently. The development task is handled in small groups in which the students organize themselves and divide the tasks independently. This involves various development phases, from the development of technical solution concepts to the development and validation of virtual prototypes and physical functional prototypes. At the end of the semester, the experiences of the development task are reflected upon.

Workload
60 h, thereof 5 h attendance time, 55 h self-study and study preparation

Learning type
Exercise and project work

M 8.109 Module: Software Engineering I (IN1INSWT1) [M-INFO-101175]

Responsible: Prof. Dr.-Ing. Anne Koziolek
Prof. Dr. Ralf Reussner
Prof. Dr. Walter Tichy

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 semester	German	3	1

Mandatory			
T-INFO-101968	Software Engineering I	6 CR	Koziolek, Reussner, Tichy
T-INFO-101995	Software Engineering I Pass	0 CR	Tichy

Competence Goal
The students acquire basic knowledge about the principles, methods and tools of software engineering. They learn how to build and to maintain complex software systems in a systematic way.

Content
The content of the lecture is the entire lifecycle of software, spanning project planning, system analysis, cost estimation, design, implementation, validation, verification, and finally the maintaining of software. The covered topics include UML, design patterns, software tools, programming environments and configuration control/versioning systems.

Workload
approx. 180 h

M 8.110 Module: Software Engineering II (IN4INSWT2) [M-INFO-100833]

Responsible: Prof. Dr.-Ing. Anne Koziolek
Prof. Dr. Ralf Reussner
Prof. Dr. Walter Tichy

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 semester	German	3	1

Mandatory			
T-INFO-101370	Software Engineering II	6 CR	Koziolek, Reussner, Tichy

Content
Requirements engineering, software development processes, software quality, software architectures, MDD, Enterprise Software Patterns software maintainability, software security, dependability, embedded software, middleware, statistic testing

M 8.111 Module: System Dynamics and Control Engineering [M-ETIT-102181]

Responsible: Prof. Dr.-Ing. Sören Hohmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Engineering Fundamentals

Credits	Language	Level	Version
6	German	3	1

Mandatory			
T-ETIT-101921	System Dynamics and Control Engineering	6 CR	Hohmann

Prerequisites
none

M 8.112 Module: Technical Thermodynamics and Heat Transfer I [M-MACH-102386]

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

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 2: Maschinenbau)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
8	German	3	4

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

Competence Certificate
Thermodynamics I: Written exam, graded, 3 hours

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

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

Prerequisites
None

Content

- 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

Workload
lectures and exercises: 75 h

homework and preparation of examination: 165 h

Learning type
Lecture
Exercise course
Tutorial

M 8.113 Module: Technical Thermodynamics and Heat Transfer II (7) [M-MACH-102830]

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

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
7	German	3	1

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

Competence Certificate
Prerequisite: attestation each semester by homework assignments

Thermodynamics II: Written exam, graded, 3 hours

Competence Goal
After attending the course students are able to:

- describe the correlation between the thermodynamic properties in mixtures of different substances.
- explain the characteristics of real substances.
- define the major concepts in gas kinetics.
- determine the composition of a reacting mixture in the thermodynamic equilibrium.
- discuss the various influences on the reaction equilibrium.
- describe the fundamental laws of heat transfer.

Module grade calculation
weight according to CP

Prerequisites
None

Content

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

Workload
lectures and exercises: 60 h

homework and preparation of examination: 150 h

Learning type
Lecture
Exercise course
Tutorial

M 8.114 Module: Theory of Probability [M-ETIT-102104]

Responsible: Dr.-Ing. Holger Jäkel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 1: Elektrotechnik und Informationstechnik)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Wahlblock 3. Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften)
Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
5	German	3	1

Mandatory			
T-ETIT-101952	Theory of Probability	5 CR	Jäkel

Prerequisites
none

M 8.115 Module: VLSI Technology [M-ETIT-100465]

Responsible: Prof. Dr. Michael Siegel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Duration	Language	Level	Version
3	1 term	German	3	1

Mandatory			
T-ETIT-100970	VLSI Technology	3 CR	Siegel

Prerequisites
none

M 8.116 Module: Wearable Robotic Technologies [M-INFO-103294]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Prof. Dr.-Ing. Michael Beigl

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Vertiefung in der Mechatronik: Ergänzungsbereich)

Credits	Language	Level	Version
4	German/English	3	2

Mandatory			
T-INFO-106557	Wearable Robotic Technologies	4 CR	Asfour, Beigl

Competence Goal

The students have received fundamental knowledge about wearable robotic technologies and understand the requirements for the design, the interface to the human body and the control of wearable robots. They are able to describe methods for modelling the human neuromusculoskeletal system, the mechatronic design, fabrication and composition of interfaces to the human body. The students understand the symbiotic human–machine interaction as a core topic of Anthropomatics and have knowledge of state of the art examples of exoskeletons, ortheses and protheses.

Content

The lecture starts with an overview of wearable robot technologies (exoskeletons, prostheses and ortheses) and its potentials, followed by the basics of wearable robotics. In addition to different approaches to the design of wearable robots and their related actuator and sensor technology, the lecture focuses on modeling the neuromusculoskeletal system of the human body and the physical and cognitive human-robot interaction for tightly coupled hybrid human-robot systems. Examples of current research and various applications of lower, upper and full body exoskeletons as well as prostheses are presented.

9 Courses

T 9.1 Course: Accessibility - Assistive Technologies for Visually Impaired Persons [T-INFO-101301]

Responsible: Prof. Dr.-Ing. Rainer Stiefelhagen
Organisation: KIT Department of Informatics
Part of: M-INFO-100764 - Accessibility - Assistive Technologies for Visually Impaired Persons

Type	Credits	Recurrence	Version
Oral examination	3	Each summer term	1

Events					
SS 2019	2400052	Accessibility - Assistive Technologies for Visually Impaired Persons	2 SWS	Lecture (V)	Stiefelhagen, Schwarz
Exams					
SS 2019	7500007	Accessibility - Assistive Technologies for Visually Impaired Persons		Prüfung (PR)	Stiefelhagen
WS 19/20	7500038	Accessibility - Assistive Technologies for Visually Impaired Persons		Prüfung (PR)	Stiefelhagen

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

V Accessibility - Assistive Technologies for Visually Impaired Persons

Lecture (V)

2400052, SS 2019, 2 SWS, Language: German, Open in study portal

Learning Content
According to the World Health Organization there are 285 million visually impaired persons worldwide, of which 39 million are blind and 246 million have low vision. The partial of full loss of sight leads to a number of challenges that visually impaired persons have to face. These include difficulties in mobility and navigation in unknown terrain, missing information in social interaction or handling and finding of objects in daily live.
There are already several technical aids available to support blind and visually impaired persons. So digitized texts can be made accessible by sound output or Braille display. There are also various tools which are especially designed for blind persons such as 'speaking' clocks or pocket calculators. However, the most important technical aid by far to improve mobility is the white cane. Although a number of electronic aids to detect obstacles and to support orientation have been developed over the last years they only offer reduced functionality for a relatively high price and are therefore rarely used.

The lecture will give an overview about IT-based assistive technology (AT) for people with visual impairments. It covers the following topics:
• Information about visual impairments and their impact
• Existing assistive technology for various application areas
• AT to access information content
• Designing barrier-free software & websites
• Possibilities and ongoing research in using computer vision methods to develop novel AT for the visually impaired, e.g. to support mobility, and content access among other things.

T 9.2 Course: Advanced Control Techniques Laboratory [T-ETIT-106054]

Responsible: Prof. Dr.-Ing. Sören Hohmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-103041 - Advanced Control Techniques Laboratory

Type	Credits	Recurrence	Version
Examination of another type	6	Each term	2

Events					
SS 2019	2303176	Praktikum Automatisierungstechnik	4 SWS	Practical course (P)	Kluwe, und Mitarbeiter
WS 19/20	2303175	Advanced Control Techniques Laboratory	4 SWS	Practical course (P)	Kluwe
Exams					
SS 2019	7303176	Advanced Control Techniques Laboratory		Prüfung (PR)	Hohmann

T 9.3 Course: Advanced Mathematics I [T-MATH-100275]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-102859 - Advanced Mathematics

Type	Credits	Recurrence	Version
Written examination	7	Each term	2

Events					
WS 19/20	0131000	Höhere Mathematik I für die Fachrichtung Maschinenbau, Geodäsie, Materialwissenschaft und Werkstofftechnik	4 SWS	Lecture (V)	Arens
WS 19/20	0131200	Höhere Mathematik I für die Fachrichtungen Chemieingenieurwesen, Verfahrenstechnik, Bioingenieurwesen und MIT	4 SWS	Lecture (V)	Arens
Exams					
SS 2019	6700025	Advanced Mathematics I		Prüfung (PR)	Hettlich, Kirsch, Arens

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

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

Modeled Conditions
The following conditions have to be fulfilled:

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

T 9.4 Course: Advanced Mathematics II [T-MATH-100276]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-102859 - Advanced Mathematics

Type	Credits	Recurrence	Version
Written examination	7	Each term	2

Events					
SS 2019	0180800	Höhere Mathematik II für die Fachrichtungen Maschinenbau, Geodäsie, Materialwissenschaft und Werkstofftechnik	4 SWS	Lecture (V)	Hettlich
SS 2019	0181000	Höhere Mathematik II für die Fachrichtungen Chemieingenieurwesen, Verfahrenstechnik, Bioingenieurwesen und MIT	4 SWS	Lecture (V)	Hettlich
Exams					
SS 2019	6700001	Advanced Mathematics II		Prüfung (PR)	Kirsch, Arens, Hettlich

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

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

Modeled Conditions
The following conditions have to be fulfilled:

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

T 9.5 Course: Advanced Mathematics III [T-MATH-100277]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-102859 - Advanced Mathematics

Type	Credits	Recurrence	Version
Written examination	7	Each term	2

Events					
WS 19/20	0131400	Höhere Mathematik III für die Fachrichtungen Maschinenbau, Chemieingenieurwesen, Verfahrenstechnik, Bioingenieurwesen und das Lehramt Maschinenbau	4 SWS	Lecture (V)	Griesmaier
Exams					
SS 2019	6700002	Advanced Mathematics III		Prüfung (PR)	Arens, Kirsch, Hettlich

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

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

Modeled Conditions
The following conditions have to be fulfilled:

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

9.6 Course: Algorithms I [T-INFO-100001]

Responsible: Prof. Dr. Peter Sanders
Organisation: KIT Department of Informatics
Part of: M-INFO-100030 - Algorithms I

Type	Credits	Recurrence	Version
Written examination	6	Each summer term	1

Events					
SS 2019	24500	Algorithms I	4 SWS	Lecture / Practice (VÜ)	Sinz, Iser
Exams					
SS 2019	7500266	Algorithms I		Prüfung (PR)	Sinz

9.7 Course: Antenna and Multiple Antenna Systems [T-ETIT-106491]

Responsible: Prof. Dr.-Ing. Thomas Zwick
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100565 - Antenna and Multiple Antenna Systems

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	1

Events					
WS 19/20	2308416	Antenna and Multiple Antenna Systems	3 SWS	Lecture (V)	Zwick
WS 19/20	2308417	Workshop for 2308416 Antenna and Multiple Antenna Systems	1 SWS	Practice (Ü)	Kowalewski
Exams					
SS 2019	7308416	Antenna and Multiple Antenna Systems		Prüfung (PR)	Zwick

Prerequisites
T-ETIT-100638 - Antennen und Mehrantennensysteme wurde weder begonnen, noch abgeschlossen.

Das Modul "Antennen und Antennensysteme" darf nichtbegonnen oder abgeschlossen sein.

T 9.8 Course: Automotive Engineering I [T-MACH-100092]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-100501 - Automotive Engineering I

Type	Credits	Recurrence	Expansion	Language	Version
Written examination	8	Each winter term	1 terms		3

Events					
WS 19/20	2113805	Automotive Engineering I	4 SWS	Lecture (V)	Gauterin, Unrau
WS 19/20	2113809	Automotive Engineering I	4 SWS	Lecture (V)	Gauterin, Gießler
Exams					
SS 2019	76-T-MACH-100092	Automotive Engineering		Prüfung (PR)	Gauterin, Unrau

Competence Certificate
Written examination

Duration: 120 minutes

Auxiliary means: none

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

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

V Automotive Engineering I

2113805, WS 19/20, 4 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content
1. History and future of the automobile

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

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

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

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

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

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

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

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

V Automotive Engineering I

2113809, WS 19/20, 4 SWS, Language: English, Open in study portal

Lecture (V)

Notes
In English language.

Learning Content
1. History and future of the automobile

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

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

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

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

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

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

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

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

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

T 9.9 Course: Automotive Engineering II [T-MACH-102117]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-100502 - Automotive Engineering II

Type	Credits	Recurrence	Version
Written examination	4	Each summer term	1

Events					
SS 2019	2114835	Automotive Engineering II	2 SWS	Lecture (V)	Unrau
SS 2019	2114855	Automotive Engineering II	2 SWS	Lecture (V)	Gießler
Exams					
SS 2019	76-T-MACH-102117	Automotive Engineering II		Prüfung (PR)	Unrau, Gauterin

Competence Certificate
Written Examination

Duration: 90 minutes

Auxiliary means: none

Prerequisites
none

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

V Automotive Engineering II — Lecture (V)
2114835, SS 2019, 2 SWS, Language: German, Open in study portal

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

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

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

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

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

V Automotive Engineering II — Lecture (V)
2114855, SS 2019, 2 SWS, Language: English, Open in study portal

Notes
In English language.

Learning Content

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

Literature
Elective literature:

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

T 9.10 Course: Bachelor Thesis [T-MACH-108800]

Responsible: Prof. Dr.-Ing. Peter Gratzfeld
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-104262 - Bachelor Thesis

Type	Credits	Recurrence	Version
Final Thesis	12	Each term	1

Competence Certificate

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 scope of the bachelor thesis corresponds to 12 ECTS. The maximal processing time of the bachelor thesis takes 6 months. The examination board defines the languages the thesis has to be written in. The date of issue of the subject has to be fixed by the supervisor and the student and to be put on record at the examination board. The subject of the bachelor thesis may be only returned once and only within the first month of processing time.

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

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

Prerequisites

The requirement for admission to the bachelor's thesis module are 120 ECTS. As to exceptions, the examination board decides on a request of the student.

Modeled Conditions

The following conditions have to be fulfilled:

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

Final Thesis

This course represents a final thesis. The following periods have been supplied:

Submission deadline	6 months
Maximum extension period	1 months
Correction period	6 weeks

T 9.11 Course: Basic Principles and Technology of Superconducting Magnets [T-ETIT-104470]

Responsible: Prof. Dr. Bernhard Holzapfel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-101970 - Basic Principles and Technology of Superconducting Magnets

Type	Credits	Recurrence	Version
Oral examination	3	Each summer term	1

Events					
SS 2019	2312676	Superconducting Technology	2 SWS	Lecture (V)	Holzapfel
Exams					
SS 2019	7312676	Basic Principles and Technology of Superconducting Magnets		Prüfung (PR)	Holzapfel

Prerequisites
none

T 9.12 Course: Basics of Manufacturing Technology [T-MACH-105219]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102549 - Manufacturing Processes

Type	Credits	Recurrence	Version
Written examination	4	Each winter term	1

Events					
WS 19/20	2149658	Basics of Manufacturing Technology	2 SWS	Lecture / Practice (VÜ)	Schulze, Zanger
Exams					
SS 2019	76-T-MACH-105219	Basics of Manufacturing Technology		Prüfung (PR)	Schulze

Competence Certificate
written exam (duration: 60 min)

Prerequisites
none

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

V Basics of Manufacturing Technology

2149658, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

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

Notes

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

Learning Content

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

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

Workload

regular attendance: 21 hours

self-study: 99 hours

T 9.13 Course: Basics of Technical Logistics [T-MACH-102163]

Responsible: Dr.-Ing. Martin Mittwollen
Jan Oellerich

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	4

Events					
WS 19/20	2117095	Basics of Technical Logistics	6 SWS	Lecture / Practice (VÜ)	Mittwollen, Oellerich
Exams					
SS 2019	76-T-MACH-102163	Basics of Technical Logistics		Prüfung (PR)	Mittwollen

Competence Certificate
The assessment consists of a written exam (60 min.).

Prerequisites
none

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

V Basics of Technical Logistics
2117095, WS 19/20, 6 SWS, Language: German, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

supplementary sheets,presentations, blackboard

Notes
lectures and practice; practice dates: look up ILIAS

Learning Content

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

Annotation
Basics knowledge of technical mechanics is preconditioned

Workload
presence: 48h

rework: 132h

Literature
Recommendations during lessons

T 9.14 Course: Battery Modeling in MATLAB [T-ETIT-106507]

Responsible: Dr.-Ing. Andre Weber
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-103271 - Battery Modeling in MATLAB

Type	Credits	Recurrence	Version
Oral examination	3	Each winter term	1

Events					
WS 19/20	2304228	Battery Modeling in MATLAB	1 SWS	Lecture (V)	Weber
WS 19/20	2304229	Tutorial for 2304228 Battery Modeling in MATLAB	1 SWS	Practice (Ü)	Weber
Exams					
SS 2019	7300017	Battery Modeling in MATLAB		Prüfung (PR)	Weber

Prerequisites
none

T 9.15 Course: Biologically Inspired Robot [T-INFO-101351]

Responsible: Prof. Dr.-Ing. Rüdiger Dillmann
Organisation: KIT Department of Informatics
Part of: M-INFO-100814 - Biologically Inspired Robot

Type	Credits	Recurrence	Version
Oral examination	3	Each summer term	1

Events					
SS 2019	24619	Biologisch Motivierte Robotersysteme	2 SWS	Lecture (V)	Rönnau, Dillmann
Exams					
SS 2019	7500237	Biologically Inspired Robot		Prüfung (PR)	Dillmann

9.16 Course: Biomedical Measurement Techniques I [T-ETIT-106492]

Responsible: Prof. Dr. Werner Nahm
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100387 - Biomedical Measurement Techniques I

Type	Credits	Recurrence	Version
Written examination	3	Each winter term	1

Events					
WS 19/20	2305269	Biomedical Measurement Techniques I	2 SWS	Lecture (V)	Nahm

Prerequisites
T-ETIT-101928 - Biomedizinische Messtechnik I darf weder begonnen noch abgeschlossen sein.

T 9.17 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-100489 - BioMEMS - Microsystems Technologies for Life Sciences and Medicine I

Type	Credits	Recurrence	Version
Written examination	4	Each winter term	2

Events					
WS 19/20	2141864	BioMEMS - Microsystems Technologies for Life-Sciences and Medicine I	2 SWS	Lecture (V)	Guber
Exams					
SS 2019	76-T-MACH-100966	BioMEMS - Microsystems Technologies for Life-Sciences and Medicine I		Prüfung (PR)	Guber

Competence Certificate
written exam (75 Min.)

Prerequisites
none

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

V BioMEMS - Microsystems Technologies for Life-Sciences and Medicine I

Lecture (V)

2141864, WS 19/20, 2 SWS, Language: German, Open in study portal

Description
Media:

Lecture script

Learning Content
Introduction into various microtechnical manufacturing methods: LIGA, Micro milling, Silicon Micromachining, Laser Microstructuring, µEDM, Metal-Etching
Biomaterials, Sterilisation.
Examples of use in the life science sector: basic micro fluidic strucutures: micro channels, micro filters, micromixers, micropumps, microvalves, Micro and nanotiter plates, Microanalysis systems (µTAS),
Lab-on-chip applications.

Annotation
The exam is held during the semester break. The date will be announced at the beginning of the semester.

Workload
Literature: 20 h

Lessions: 21 h

Preparation and Review: 50 h

Exam preparation: 30 h

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

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102684 - CAE-Workshop
M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Examination of another type	4	Each term	2

Events					
SS 2019	2147175	CAE-Workshop	3 SWS	Block (B)	Albers, Mitarbeiter
WS 19/20	2147175	CAE-Workshop	3 SWS	Block (B)	Albers, Mitarbeiter
Exams					
SS 2019	76-T-MACH-105212	CAE-Workshop		Prüfung (PR)	Albers

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

Prerequisites
None

Annotation
For a successful participation in the examination a continuous attendance at the workshop days is necessary. Limited number of participants. Selection is made according to a selection procedure.

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

V CAE-Workshop
2147175, SS 2019, 3 SWS, Language: German, Open in study portal

Block (B)

Notes

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

Workload
regular attendance: 31.5 h

self-study: 58 h

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

discussing and presenting results in small groups

V CAE-Workshop
2147175, WS 19/20, 3 SWS, Language: German, Open in study portal

Block (B)

Notes

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

Workload
regular attendance: 31.5 h

self-study: 58 h

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

discussing and presenting results in small groups

T 9.19 Course: Cognitive Systems [T-INFO-101356]

Responsible: Prof. Dr.-Ing. Rüdiger Dillmann
Prof. Dr. Alexander Waibel

Organisation: KIT Department of Informatics

Part of: M-INFO-100819 - Cognitive Systems

Type	Credits	Recurrence	Version
Written examination	6	Each summer term	1

Events					
SS 2019	24572	Kognitive Systeme	4 SWS	Lecture / Practice (VÜ)	Dillmann, Waibel, Stüker, Meißner
Exams					
SS 2019	7500157	Cognitive Systems		Prüfung (PR)	Dillmann, Waibel

9.20 Course: Communication Engineering I [T-ETIT-101936]

Responsible: Dr.-Ing. Holger Jäkel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-102103 - Communication Engineering I

Type	Credits	Recurrence	Version
Written examination	6	Each summer term	1

Events					
SS 2019	2310506	Communication Engineering I	3 SWS	Lecture (V)	Schmalen
SS 2019	2310508	Übungen zu 2310506 Nachrichtentechnik I	1 SWS	Practice (Ü)	Jäkel, Müller
Exams					
SS 2019	7310506	Communication Engineering I		Prüfung (PR)	Schmalen

Prerequisites
none

T 9.21 Course: Communications Engineering II [T-ETIT-100745]

Responsible: Dr.-Ing. Holger Jäkel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100440 - Communications Engineering II

Type	Credits	Recurrence	Version
Written examination	4	Each winter term	2

Events					
WS 19/20	2310511	Communications Engineering II	2 SWS	Lecture (V)	Jäkel
WS 19/20	2310513	Tutorial for 2310511 Communications Engineering II	1 SWS	Practice (Ü)	Wunsch
Exams					
SS 2019	7310511	Communications Engineering II		Prüfung (PR)	Jäkel

9.22 Course: Complex Analysis and Integral Transformations [T-ETIT-109285]

Responsible: Dr.-Ing. Mathias Kluwe
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104534 - Complex Analysis and Integral Transformations

Type	Credits	Recurrence	Expansion	Version
Completed coursework (written)	4	Each summer term	1 terms	1

Events					
SS 2019	2303190	Complex analysis and integral transformations	1 SWS	Lecture (V)	Kluwe
SS 2019	2303191	Übungen zu 2303190 Komplexe Analysis und Integraltransformationen	1 SWS	Practice (Ü)	
Exams					
SS 2019	7303190	Complex Analysis and Integral Transformations		Prüfung (PR)	Kluwe

Prerequisites
none

T 9.23 Course: Composite Manufacturing - Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies [T-MACH-105535]

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

Part of: M-ETIT-102734 - Materials

Type	Credits	Recurrence	Version
Written examination	4	Each summer term	2

Events					
SS 2019	2114053	Composite Manufacturing – Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies	2 SWS	Lecture (V)	Henning
Exams					
SS 2019	7600002	Composite Manufacturing - Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies		Prüfung (PR)	
SS 2019	76-T-MACH-105535	Composite Manufacturing - Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies		Prüfung (PR)	Henning

Competence Certificate
written exam 90 minutes

Prerequisites
none

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-ETIT-100292 - Passive Components must not have been started.
2. The course T-MACH-100531 - Systematic Materials Selection must not have been started.

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

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

Lecture (V)

2114053, SS 2019, 2 SWS, Language: German, Open in study portal

Learning Content
Physical connections of fiber reinforcement

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

resins
thermoplastics
duromeres

mechanisms of reinforcements
glas fibers
carbon fibers
aramid fibers
natural fibers

semi-finished products - textiles

process technologies - prepregs

recycling of composites

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

T 9.24 Course: Computer Organization [T-INFO-103531]

Responsible: Prof. Dr. Wolfgang Karl
Organisation: KIT Department of Informatics
Part of: M-INFO-103179 - Computer Organization

Type	Credits	Version
Written examination	6	1

Events					
WS 19/20	24502	Computer Organization	3 SWS	Lecture (V)	Henkel, Bauer
WS 19/20	24505	Übungen zu Rechnerorganisation	2 SWS	Practice (Ü)	Henkel
Exams					
SS 2019	7500240	Computer Organization		Prüfung (PR)	Henkel

T 9.25 Course: Control of Linear Multivariable Systems [T-ETIT-100666]

Responsible: Prof. Dr.-Ing. Sören Hohmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100374 - Control of Linear Multivariable Systems

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	1

Events					
WS 19/20	2303177	Control of Linear Multivariable Systems	3 SWS	Lecture (V)	Kluwe
WS 19/20	2303179	Control of Linear Multivariable Systems (Tutorial to 2303177)	1 SWS	Practice (Ü)	Köpf
Exams					
SS 2019	7303177	Control of Linear Multivariable Systems		Prüfung (PR)	Kluwe

Prerequisites
none

T 9.26 Course: Control Systems Design Lab [T-ETIT-106053]

Responsible: Prof. Dr.-Ing. Sören Hohmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-103040 - Control Systems Design Lab

Type	Credits	Recurrence	Version
Examination of another type	6	Each summer term	1

Events					
SS 2019	2303165	Labor Regelungssystemdesign	4 SWS	Block (B)	Hohmann
Exams					
SS 2019	7303165	Control Systems Design Lab		Prüfung (PR)	Hohmann

Prerequisites
none

T 9.27 Course: Cooperation in interdisciplinary teams [T-MACH-105699]

Responsible: Prof. Dr.-Ing. Sven Matthiesen
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104355 - Soft Skills

Type	Credits	Recurrence	Version
Completed coursework	2	Each winter term	1

Events					
WS 19/20	2145166	Cooperation in interdisciplinary teams	SWS	Practical course (P)	Matthiesen

Competence Certificate
Accompanying the workshop, delivery services are required. In these the application of the knowledge of the students is examined.

Prerequisites
none

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

V Cooperation in interdisciplinary teams
2145166, WS 19/20, SWS, Language: German, Open in study portal

Practical course (P)

Learning Content

- Introduction
- Product development processes
- MBSE and SysML
- Mechatronic selection of solutions
- Methods of early validation
- Architectural design
- Virtual functional design
- Validation and verification
- Reflection and presentation of the team results

Annotation
All lecture notes and excercises are provided via the elearning platform ILIAS.

Literature
Alt, Oliver (2012): Modell-basierte Systementwicklung mit SysML. In der Praxis. In: Modellbasierte Systementwicklung mit SysML.

Janschek, Klaus (2010): Systementwurf mechatronischer Systeme. Methoden - Modelle - Konzepte. Berlin, Heidelberg: Springer.

Weilkiens, Tim (2008): Systems engineering mit SysML/UML. Modellierung, Analyse, Design. 2., aktualisierte u. erw. Aufl. Heidelberg: Dpunkt-Verl.

T 9.28 Course: Deep Learning and Neural Networks [T-INFO-109124]

Responsible: Prof. Dr. Alexander Waibel
Organisation: KIT Department of Informatics
Part of: M-INFO-104460 - Deep Learning and Neural Networks

Type	Credits	Recurrence	Version
Written examination	6	Each summer term	1

Events					
SS 2019	2400024	Deep Learning and Neural Networks	4 SWS	Lecture (V)	Waibel, Pham
Exams					
SS 2019	7500044	Deep Learning and Neural Networks		Prüfung (PR)	Waibel

T 9.29 Course: Digital Technology [T-ETIT-101918]

Responsible: Prof. Dr.-Ing. Jürgen Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-102102 - Digital Technology

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	1

Events					
WS 19/20	2311615	Digital Technology	3 SWS	Lecture (V)	Becker
WS 19/20	2311617	Tutorial for 2311615 Digital Technology	1 SWS	Practice (Ü)	Kempf
Exams					
SS 2019	7311615	Digital Technology		Prüfung (PR)	Becker

Prerequisites
none

T 9.30 Course: Distributed Discrete Event Systems [T-ETIT-100960]

Responsible: Prof. Dr.-Ing. Fernando Puente León
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100361 - Distributed Discrete Event Systems

Type	Credits	Recurrence	Version
Written examination	4	Each summer term	1

Events					
SS 2019	2302106	Verteilte ereignisdiskrete Systeme	2 SWS	Lecture (V)	Puente León
SS 2019	2302108	Übungen zu 2302106 Verteilte ereignisdiskrete Systeme	1 SWS	Practice (Ü)	Weinreuter
Exams					
SS 2019	7302106	Distributed Discrete Event Systems		Prüfung (PR)	Puente León

Prerequisites
none

T 9.31 Course: Dosimetry of Ionising Radiation [T-ETIT-104505]

Responsible: Prof. Dr. Olaf Dössel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-101847 - Dosimetry of Ionising Radiation

Type	Credits	Recurrence	Version
Oral examination	3	Each winter term	1

Events					
WS 19/20	2305294	Dosimetry of Ionising Radiation	2 SWS	Lecture (V)	Breustedt
Exams					
SS 2019	7305294	Dosimetry of Ionising Radiation		Prüfung (PR)	Breustedt

Prerequisites
none

T 9.32 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-ETIT-102156 - Electric Energy Systems

Type	Credits	Recurrence	Version
Written examination	5	Each summer term	1

Events					
SS 2019	2307391	Electric Energy Systems	2 SWS	Lecture (V)	Leibfried
SS 2019	2307393	Übungen zu 2307391 Elektroenergiesysteme	1 SWS	Practice (Ü)	Görtz
Exams					
SS 2019	7307391	Electric Energy Systems		Prüfung (PR)	Leibfried

Prerequisites
none

T 9.33 Course: Electric Rail Vehicles [T-MACH-102121]

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

Part of: M-MACH-102692 - Electric Rail Vehicles

Type	Credits	Recurrence	Version
Oral examination	4	Each summer term	1

Events					
SS 2019	2114346	Electric Rail Vehicles	2 SWS	Lecture (V)	Gratzfeld
Exams					
SS 2019	76-T-MACH-102121	Electrical Railway Traction Systems		Prüfung (PR)	Gratzfeld
WS 19/20	76-T-MACH-102121	Electric Rail Vehicles		Prüfung (PR)	Gratzfeld

Competence Certificate
Oral examination

Duration: ca. 20 minutes

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

Prerequisites
none

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

V Electric Rail Vehicles
2114346, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Description
Media:

All slides are available for download (Ilias-platform).

Notes

1. Introduction: history of electric traction in railway vehicles, economic impact
2. Wheel-rail-contact: carrying of vehicle mass, adhesion, current return
3. Vehicle dynamics: tractive and brake effort, driving resistance, inertial force, load cycles
4. Electric drives: purpose of electric drive and basic configurations, traction motors (induction machine, synchronous machine with permanent magnets), drives for vehicles at dc and ac lines, drives for vehicle without contact wire, hybrids, conventional drives for existing vehicles
5. Train control management system: definitions, networks, bus systems, components, examples
6. Vehicle concepts: modern vehicle concepts for mass transit and electric main line
7. Traction power supply: dc and ac networks, energy management, design aspects

Learning Content

1. Introduction: history of electric traction in railway vehicles, economic impact
2. Wheel-rail-contact: carrying of vehicle mass, adhesion, current return
3. Vehicle dynamics: tractive and brake effort, driving resistance, inertial force, load cycles
4. Electric drives: traction motors, power conversion, drives for vehicles at dc and ac lines, dieselelectric vehicles, multi system vehicles, axle drives, transmission of tractive effort to the rails
5. Train control management system: definitions, networks, bus systems, components, examples
6. Vehicle concepts: modern vehicle concepts for mass transit and electric main line
7. Traction power supply: networks, substations, inductive power supply, energy management

Workload
Regular attendance: 21 hours

Self-study: 21 hours

Exam and preparation: 78 hours

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

T 9.34 Course: Electrical Machines and Power Electronics [T-ETIT-101954]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-102124 - Electrical Machines and Power Electronics

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	1

Events					
SS 2019	2306307	Electrical Machines and Power Electronics	2 SWS	Lecture (V)	Hiller
SS 2019	2306309	Übungen zu 2306307 Elektrische Maschinen und Stromrichter	2 SWS	Practice (Ü)	Hiller
Exams					
SS 2019	7306307	Electrical Machines and Power Electronics		Prüfung (PR)	Braun

Prerequisites
none

T 9.35 Course: Electromagnetical Fields [T-ETIT-109078]

Responsible: Prof. Dr. Martin Doppelbauer
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104428 - Electromagnetical Fields

Type	Credits	Recurrence	Version
Written examination	6	Each summer term	1

Events					
SS 2019	2306004	Electromagnetical Fields	2 SWS	Lecture (V)	Doppelbauer
SS 2019	2306005	Practice to 2306004 Electromagnetic fields	2 SWS	Practice (Ü)	Doppelbauer
Exams					
SS 2019	7300019	Electromagnetical Fields		Prüfung (PR)	Doppelbauer

Prerequisites
none

T 9.36 Course: Electromagnetical Waves [T-ETIT-109245]

Responsible: Prof. Dr.-Ing. Sebastian Randel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104515 - Electromagnetical Waves

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	1

T 9.37 Course: Electronic Devices an Circuits - Workshop [T-ETIT-109138]

Responsible: Prof. Dr. Michael Siegel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104465 - Electronic Devices and Circuits

Type	Credits	Recurrence	Version
Completed coursework	1	Each summer term	1

Events					
SS 2019	2308450	Elektronische Schaltungen - Workshop	1 SWS	Practical course (P)	Zwick
Exams					
SS 2019	7308450	Electronic Devices an Circuits - Workshop		Prüfung (PR)	Zwick, Siegel

T 9.38 Course: Electronic Devices and Circuits [T-ETIT-109318]

Responsible: Prof. Dr. Michael Siegel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104465 - Electronic Devices and Circuits

Type	Credits	Recurrence	Expansion	Version
Written examination	6	Each summer term	1 terms	2

Events					
SS 2019	2312655	Electronic Devices and Circuits	3 SWS	Lecture (V)	Siegel
SS 2019	2312657	Übungen zu 2312655 Elektronische Schaltungen	1 SWS	Practice (Ü)	Dörner
SS 2019	2312658	Tutorien zu 2312655 Elektronische Schaltungen	2 SWS		Wünsch
Exams					
SS 2019	7312655	Electronic Devices and Circuits		Prüfung (PR)	Siegel
WS 19/20	7312655	Electronic Devices and Circuits		Prüfung (PR)	Siegel

T 9.39 Course: Engineering Mechanics I [T-MACH-100282]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102402 - Engineering Mechanics
M-MACH-104333 - Orientation Exam

Type	Credits	Recurrence	Version
Written examination	7	Each winter term	2

Events					
WS 19/20	2161245	Engineering Mechanics I	3 SWS	Lecture (V)	Böhlke
WS 19/20	3161010	Engineering Mechanics I (Lecture)	3 SWS	Lecture (V)	Langhoff, Böhlke
Exams					
SS 2019	76-T-MACH-100282	Engineering Mechanics I		Prüfung (PR)	Böhlke, Langhoff
SS 2019	76-T-MACH-100282-englisch	Engineering Mechanics I		Prüfung (PR)	Langhoff, Böhlke

Competence Certificate
written exam, 90 min, graded

Prerequisites
successful participation in "Engineering Mechanics I (Tutorial)" (see T-MACH-100528)

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-100528 - Tutorial Engineering Mechanics I must have been passed.

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

V Engineering Mechanics I

2161245, WS 19/20, 3 SWS, Language: German, Open in study portal

Lecture (V)

Notes

- 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

Learning Content

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

Workload
regular attendance: 52,5 hours
self-study: 127,5 hours

Literature
lecture notes

Hibbeler, R.C: Technische Mechanik 1 - Statik. Prentice Hall. Pearson Studium 2005.

Gross, D. et al.: Technische Mechanik 1 - Statik. Springer 2006.

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

Parkus, H.: Mechanik der festen Körper. Springer 1988.

T 9.40 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-102402 - Engineering Mechanics

Type	Credits	Recurrence	Version
Written examination	6	Each summer term	2

Events					
SS 2019	2162250	Engineering Mechanics II	3 SWS	Lecture (V)	Schneider
SS 2019	3162010	Engineering Mechanics II (Lecture)	3 SWS	Lecture (V)	Langhoff
Exams					
SS 2019	76-T-MACH-100283	Engineering Mechanics II		Prüfung (PR)	Böhlke, Langhoff
SS 2019	76-T-MACH-100283-englisch	Engineering Mechanics II		Prüfung (PR)	Böhlke, Langhoff

Competence Certificate
written exam, 90 min, graded

Prerequisites
successful participation in "Engineering Mechanics II (Tutorial)" (see T-MACH-100284)

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-100284 - Tutorial Engineering Mechanics II must have been passed.

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

V Engineering Mechanics II

2162250, SS 2019, 3 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content

- bending
- shear
- torsion
- stress and strain state in 3D
- Hooke's law in 3D
- elasticity theors in 3D
- energy methods in elastostatics
- approximation methods
- stability
- inelastic material behaviour

Workload
regular attendance: 42 hours
self-study: 138 hours

Literature

lecture notes
Hibbeler, R.C: Technische Mechanik 2 - Festigkeitslehre. Prentice Hall. Pearson Studium 2005.
Gross, D. et al.: Technische Mechanik 2 - Elastostatik. Springer 2006.
Gummert, P.; Reckling, K.-A.: Mechanik. Vieweg 1994.
Parkus, H.: Mechanik der festen Körper. Springer 1988.

T 9.41 Course: Engineering Mechanics III [T-MACH-100299]

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

Part of: M-MACH-102402 - Engineering Mechanics

Type	Credits	Recurrence	Version
Written examination	5	Each winter term	2

Events					
WS 19/20	2161203	Engineering Mechanics III	2 SWS	Lecture (V)	Seemann
Exams					
SS 2019	76-T-MACH-100299	Engineering Mechanics III		Prüfung (PR)	Seemann

Competence Certificate
written exam (90 min)

Prerequisites
successful participation in "Engineering Mechanics III (Tutorial)" (see T-MACH-105202)

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-105202 - Tutorial Engineering Mechanics III must have been passed.

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

V Engineering Mechanics III — Lecture (V)
2161203, WS 19/20, 2 SWS, Language: German, Open in study portal

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

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

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

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

Workload
time of attendance: 24h; self-study: 65h

Literature

Hibbeler: Technische Mechanik 3, Dynamik, München, 2006

Gross, Hauger, Schnell: Technische Mechanik Bd. 3, Heidelberg, 1983

Lehmann: Elemente der Mechanik III, Kinetik, Braunschweig, 1975

Göldner, Holzweissig: Leitfaden der Technischen Mechanik.

Hagedorn: Technische Mechanik III.

T 9.42 Course: Engineering Mechanics IV [T-MACH-105274]

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

Part of: M-MACH-102831 - Engineering Mechanics IV
M-MACH-103205 - Engineering Mechanics

Type	Credits	Recurrence	Version
Written examination	5	Each summer term	1

Events					
SS 2019	2162231	Engineering Mechanics IV	2 SWS	Lecture (V)	Seemann
SS 2019	2162232	Engineering Mechanics IV (Tutorial)	2 SWS	Practice (Ü)	Seemann, Yüzbasioglu, Keller
Exams					
SS 2019	76-T-MACH-105274	Engineering Mechanics IV		Prüfung (PR)	Seemann

Competence Certificate
Written examination

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

V Engineering Mechanics IV — Lecture (V)
2162231, SS 2019, 2 SWS, Language: German, Open in study portal

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

Workload
time of attendance: 24h; self-study: 65h

Literature
Hibbeler: Technische Mechanik 3, Dynamik, München, 2006
Marguerre: Technische Mechanik III, Heidelberger Taschenbücher, 1968
Magnus: Kreisel, Theorie und Anwendung, Springer-Verlag, Berlin,
1971 Klotter: Technische Schwingungslehre, 1. Bd. Teil A, Heidelberg

V Engineering Mechanics IV (Tutorial) — Practice (Ü)
2162232, SS 2019, 2 SWS, Language: German, Open in study portal

Learning Content
In the Tutorial excercises for the corresponding subjects of the lecture are presented. During the tutorial part of the excercises are presented and instructions are given for those excercises which have to be done as homework.

The homework is mandatory and is corrected by the tutors. A successful elaboration of the homework is necessary to take part in the final exam.

Workload
time of attendance: 21h; self-study: 39h

Literature

Hibbeler: Technische Mechanik 3, Dynamik, München, 2006
Marguerre: Technische Mechanik III, Heidelberger Taschenbücher, 1968
Magnus: Kreisel, Theorie und Anwendung, Springer-Verlag, Berlin,
1971 Klotter: Technische Schwingungslehre, 1. Bd. Teil A, Heidelberg

T 9.43 Course: Examination Material Science I & II [T-MACH-105148]

Responsible: Dr.-Ing. Johannes Schneider
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102567 - Material Science and Engineering

Type	Credits	Recurrence	Version
Oral examination	9	Each winter term	1

Events					
SS 2019	2182562	Materials Science and Engineering II for ciw, vt, mit, ip-m	4 SWS	Lecture / Practice (VÜ)	Schneider
WS 19/20	2181555	Materials Science and Engineering I for ciw, vt, MIT	4 SWS	Lecture / Practice (VÜ)	Schneider
Exams					
SS 2019	76-T-MACH-105148	Examination Material Science I & II		Prüfung (PR)	Schneider
WS 19/20	76-T-MACH-105148	Examination Material Science I, II		Prüfung (PR)	Schneider

Competence Certificate
oral; 30 to 40 minutes

No tools and reference tools are allowed!

Prerequisites
none

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

V Materials Science and Engineering II for ciw, vt, mit, ip-m

Lecture / Practice (VÜ)

2182562, SS 2019, 4 SWS, Language: German, Open in study portal

Notes

Ferrous materials

Non-ferrous metals and alloys

Polymers

Engineering ceramics

Composites

The students are able to describe the relationship between atomic structure, microscopical observations, and properties of solid materials.

The students can name representative materials for different material classes and can describe the differences.

The students are able to describe the basic mechanisms of hardening for ferrous and non-ferrous materials and reflect these mechanisms using phase and TTT diagrams.

The students can interpret given phase, TTT or other diagrams relevant for materials science, gather information from them and can correlate them regarding the microstructure evolution.

The students can describe the phenomena correlated with materials science in polymers, metals and ceramics and depict differences.

The students know about standard materials characterization methods and are able to asses materials on base of the data obtained by these methods.

regular attendance: 45 hours
self-study: 105 hours

Combined oral exam with Materials Science and Engineering I; 30 to 40 minutes

No tools and reference tools are allowed!

Learning Content

Ferrous materials

Non-ferrous metals and alloys

Polymers

Engineering ceramics

Composites

Workload

regular attendance: 45 hours
self-study: 105 hours

Literature

Lecture Notes

Problem Sheets;

J.F. Shackelford: Introduction to Materials Science for Engineers. Prentice Hall, 2008 (eBook)

W. D. Callister: Materials Science and Engineering. John Wiley & Sons, 2013 (eBook)

M. Ashby: Materials. Elsevier, 2007 (eBook)

V **Materials Science and Engineering I for ciw, vt, MIT** **Lecture / Practice (VÜ)**

2181555, WS 19/20, 4 SWS, Language: German, Open in study portal

Notes
Atomic structure and atomic bonds

Structures of crystalline and amorphous solids

Defects in crystalline solids

Alloys

Transport and transformation phenomena in the solid state
Corrosion

Wear

Mechanical properties
Testing of materials
The students are able to describe the relationship between atomic structure, microscopical observations, and properties of solid materials.

The students can describe the typical property profiles and can name applications for the most important engineering materials.

The students are able to describe standard materials characterization methods and can explain the evaluation of these methods. They can judge materials on base of the data obtained by these methods.
regular attendance: 45 hours
self-study: 75 hours
Oral exam in combination with Materials Science and Engineering II; oral; 30 to 40 minutes
No tools and reference tools are allowed!

Learning Content
Atomic structure and atomic bonds

Structures of crystalline and amorphous solids

Defects in crystalline solids

Alloys

Transport and transformation phenomena in the solid state
Corrosion

Wear

Mechanical properties
Testing of materials

Workload
regular attendance: 45 hours
self-study: 75 hours

Literature
Lecture Notes
Problem Sheets

J.F. Shackelford: Introduction to Materials Science for Engineers. Prentice Hall, 2008 (eBook)
W. D. Callister: Materials Science and Engineering. John Wiley & Sons, 2013 (eBook)
M. Ashby: Materials. Elsevier, 2007 (eBook)

T 9.44 Course: Excercises in Technical Thermodynamics and Heat Transfer I [T-MACH-105204]

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

Part of: M-MACH-102386 - Technical Thermodynamics and Heat Transfer I

Type	Credits	Recurrence	Version
Completed coursework (written)	0	Each winter term	1

Events					
WS 19/20	2165502	Exercise course Technical Thermodynamics and Heat Transfer I	2 SWS	Practice (Ü)	Maas
WS 19/20	3165015	Technical Thermodynamics and Heat Transfer I (Tutorial)	2 SWS	Tutorial (Tu)	Schießl, Maas
Exams					
SS 2019	76-T-MACH-105204	Excercises in Technical Thermodynamics and Heat Transfer I		Prüfung (PR)	Maas

Competence Certificate
Homework is mandatory.

T 9.45 Course: Excercises in Technical Thermodynamics and Heat Transfer II [T-MACH-105288]

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

Part of: M-MACH-102830 - Technical Thermodynamics and Heat Transfer II

Type	Credits	Recurrence	Version
Completed coursework	0	Each summer term	1

Events					
SS 2019	2166556	Technical Thermodynamics and Heat Transfer II (Tutorial)	2 SWS	Practice (Ü)	Maas
SS 2019	3166033	Technical Thermodynamics and Heat Transfer II (Tutorial)	2 SWS	Practice (Ü)	Schießl, Maas
Exams					
SS 2019	76-T-MACH-105288	Excercises in Technical Thermodynamics and Heat Transfer II		Prüfung (PR)	Maas

Competence Certificate
Homework is mandatory.

Prerequisites
none

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

V Technical Thermodynamics and Heat Transfer II (Tutorial)
2166556, SS 2019, 2 SWS, Language: German, Open in study portal

Practice (Ü)

Learning Content
Calculation of thermodynamical problems

Workload
Regular attendance: 21,0 hours
Self-stuy: 28 hours

Literature
Course notes
Elsner, N.; Dittmann, A.: Energielehre und Stoffverhalten (Grundlagen der technischen Thermodynamik Bd. 1 und 2), 8. Aufl., Akademie-Verlag, 680 S. 1993.
Baehr, H.D.: Thermodynamik: eine Einführung in die Grundlagen und ihre technischen Anwendungen, 9. Aufl., Springer-Verlag, 460 S., 1996.

T 9.46 Course: Fluid Mechanics 1&2 [T-MACH-105207]

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

Part of: M-MACH-102565 - Fluid Mechanics

Type	Credits	Recurrence	Version
Written examination	8	Each summer term	2

Events					
SS 2019	2154512	Fluid Mechanics I	3 SWS	Lecture / Practice (VÜ)	Frohnapfel
SS 2019	3154510	Fluid Mechanics I	3 SWS	Lecture / Practice (VÜ)	Frohnapfel
WS 19/20	2153512	Fluid Mechanics II	3 SWS	Lecture / Practice (VÜ)	Frohnapfel
WS 19/20	3153511	Fluid Mechanics II	3 SWS	Lecture / Practice (VÜ)	Frohnapfel
Exams					
SS 2019	76-T-MACH-105207	Fluid Mechanics (1+2)		Prüfung (PR)	Frohnapfel, Kriegseis
WS 19/20	76-T-MACH-105207	Fluid Mechanics (1+2)		Prüfung (PR)	Frohnapfel

Competence Certificate
written exam 3 hours

Prerequisites
none

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

V Fluid Mechanics I
Lecture / Practice (VÜ)

2154512, SS 2019, 3 SWS, Language: German, Open in study portal

Description
Media:

Blackboard, Power Point, Experiments

Learning Content
Introduction to the fundamentals of fluid mechanics for students of mechanical engineering and related fields, physics and mathematics. The lecture is complemented by a tutorial.

- Introduction
- Flows in Nature and Technologie
- Fundamentals of Fluid Mechanics
- Properties of Fluids and Characteristic Fluid Regimes
- Fundamental Equations of Fluid Mechanics (Conservation of Mass, Momentum and Energy)
    - Continuity equation
    - Navier-Stokes equations (Euler Equations)
    - Energy equation
- Hydro- und Aerostatics
- Flows without dissipation (lossless)
- Technical Flows with Losses
- Introduction to Similarity Analysis
- Two-Dimensional Viscous Flows
- Integral Form of the Governing Equations
- Introduction to Gas Dynamics

Workload
regular attendance: 42 hours
self-study: 168 hours

Literature
Kundu, P.K., Cohen, K.M.: Fluid Mechanics, Elsevier, 4th Edition, 2008

Durst, F.: Fluid Mechanics: An Introduction to the Theory of Fluid Flows, Springer 2008

Batchelor, G.K.: An Introduction to Fluid Dynamics, Cambridge Mathematical Library

V **Fluid Mechanics II** **Lecture / Practice (VÜ)**
2153512, WS 19/20, 3 SWS, Language: German, Open in study portal

Description
Media:

Blackboard, Power Point, Experiments

Notes
The students know how to derive the fundamental equations for mass and momentum conservation and can introduce material laws for fluids into those. They can discuss the physical meaning of the different terms in the Navier-Stokes-Equations. They are capable of simplifying the mathematical equations that describe the motion of fluids and can compute flow quantities for generic problems based on these simplified equations. This includes the calculation of static and dynamic forces acting from the fluid onto the solid as well as the detailed analysis of two-dimensional viscous flows.

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

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

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

Literature
Kundu, P.K., Cohen, K.M.: Fluid Mechanics, Elsevier, 4th Edition, 2008

Durst, F.: Fluid Mechanics: An Introduction to the Theory of Fluid Flows, Springer 2008

Batchelor, G.K.: An Introduction to Fluid Dynamics, Cambridge Mathematical Library

V **Fluid Mechanics II** — **Lecture / Practice (VÜ)**
3153511, WS 19/20, 3 SWS, Language: English, Open in study portal

Description
Media:

Blackboard, Power Point, Experiments

Notes
The students know how to derive the fundamental equations for mass and momentum conservation and can introduce material laws for fluids into those. They can discuss the physical meaning of the different terms in the Navier-Stokes-Equations. They are capable of simplifying the mathematical equations that describe the motion of fluids and can compute flow quantities for generic problems based on these simplified equations. This includes the calculation of static and dynamic forces acting from the fluid onto the solid as well as the detailed analysis of two-dimensional viscous flows.

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

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

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

Literature
Kundu, P.K., Cohen, K.M.: Fluid Mechanics, Elsevier, 4th Edition, 2008

Durst, F.: Fluid Mechanics: An Introduction to the Theory of Fluid Flows, Springer 2008

Batchelor, G.K.: An Introduction to Fluid Dynamics, Cambridge Mathematical Library

T 9.47 Course: Fluid Power Systems [T-MACH-102093]

Responsible: Prof. Dr.-Ing. Marcus Geimer
Felix Pult

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	4	Each winter term	2

Events					
WS 19/20	2114093	Fluid Technology	2 SWS	Lecture (V)	Geimer, Pult
Exams					
SS 2019	76-T-MACH-102093	Fluid Power Systems		Prüfung (PR)	Geimer
WS 19/20	76T-MACH-102093	Fluid Power Systems		Prüfung (PR)	Geimer

Competence Certificate
The assessment consists of a writen exam (90 minutes) taking place in the recess period. The exam takes place in every semester. Re-examinations are offered at every ordinary examination date.

Prerequisites
none

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

V Fluid Technology

2114093, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content
In the range of hydrostatics the following topics will be introduced:

- Hydraulic fluids
- Pumps and motors
- Valves
- Accessories
- Hydraulic circuits.

In the range of pneumatics the following topics will be introduced:

- Compressors
- Motors
- Valves
- Pneumatic circuits.

Workload

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

Literature
Scritum for the lecture *Fluidtechnik*

Institute of Vehicle System Technology

downloadable

T 9.48 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-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Oral examination	5	Each winter term	1

Events					
WS 19/20	2133123	Fundamentals of Combustion Engine Technology	2 SWS	Lecture (V)	Kubach, Wagner, Toedter, Pfeil, Bernhardt, Velji
Exams					
SS 2019	76-T-MACH-105652	Fundamentals of Combustion Engine Technology		Prüfung (PR)	Kubach
WS 19/20	76-T-MACH-105652	Fundamentals of Combustion Engine Technology		Prüfung (PR)	Kubach

Competence Certificate
oral exam, 30 min

Prerequisites
none

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

V Fundamentals of Combustion Engine Technology

2133123, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Notes
Fundamentals of engine processes

Components of combustion engines

Mixture formation systems

Gasexchange systems

Injection systems

Exhaust Gas Aftertreatment Systems

Cooling systems

Ignistion Systems

Learning Content

Fundamentals of engine processes

Components of combustion engines

Mixture formation systems

Gasexchange systems

Injection systems

Exhaust Gas Aftertreatment Systems

Cooling systems

Ignistion Systems

Workload

regular attendance 25 h

self-study 125 h

T 9.49 Course: Fundamentals of Combustion I [T-MACH-105213]

Responsible: Prof. Dr. Ulrich Maas
Dr. Jörg Sommerer

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	4	Each winter term	1

Events					
WS 19/20	2165515	Fundamentals of Combustion I	2 SWS	Lecture (V)	Maas
WS 19/20	2165517	Fundamentals of Combustion I (Tutorial)	1 SWS	Practice (Ü)	Bykov
WS 19/20	3165016	Fundamentals of Combustion I	2 SWS	Lecture (V)	Maas
WS 19/20	3165017	Fundamentals of Combustion I (Tutorial)	1 SWS	Practice (Ü)	Bykov
Exams					
SS 2019	76-T-MACH-105213	Fundamentals of Combustion I		Prüfung (PR)	Maas

Competence Certificate
Written exam, 3 h

Prerequisites
none

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

V Fundamentals of Combustion I
2165515, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Description
Media:

Blackboard and Powerpoint presentation

Learning Content

- Fundamental concepts ans phenomena
- Experimental analysis of flames
- Conservation equations for laminar flat flames
- Chemical reactions
- Chemical kinetics mechanisms
- Laminar premixed flames
- Laminar diffusion flames
- Ignition processes
- Pollutant formation

Annotation
Compulsory elective subject: 2+1 SWS and 5 LP.

Workload
Regular attendance: 22.5 h

Self-study: 97.5 h

Literature
Lecture notes,

Combustion - Physical and Chemical Fundamentals, Modeling and Simulation, Experiments, Pollutant Formation, authors: U. Maas, J. Warnatz, R.W. Dibble, Springer-Lehrbuch, Heidelberg 1996

V **Fundamentals of Combustion I (Tutorial)** **Practice (Ü)**
2165517, WS 19/20, 1 SWS, Open in study portal

Literature

- Lecture Notes
- J. Warnatz; U. Maas; R.W. Dibble: Combustion, Springer, Heidelberg 1996

T 9.50 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-102690 - Fundamentals of Energy Technology

Type	Credits	Recurrence	Version
Written examination	8	Each summer term	1

Events					
SS 2019	2130927	Fundamentals of Energy Technology	3 SWS	Lecture (V)	Cheng, Badea
SS 2019	3190923	Fundamentals of Energy Technology	3 SWS	Lecture (V)	Badea
Exams					
SS 2019	76-MACH-105220 Fundamentals of Energy Technology	Fundamentals of Energy Technology		Prüfung (PR)	Badea
SS 2019	76-T-MACH-105220	Fundamentals of Energy Technology		Prüfung (PR)	Cheng, Badea
WS 19/20	76-MACH-105220 Fundamentals of Energy Technology	Fundamentals of Energy Technology		Prüfung (PR)	Badea
WS 19/20	76-T-MACH-105220	Fundamentals of Energy Technology		Prüfung (PR)	Badea, Cheng

Competence Certificate
Written examination, 90 min

Prerequisites
none

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

V Fundamentals of Energy Technology
2130927, SS 2019, 3 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content
The following relevant fields of the energy industry are covered:
- Energy demand and energy situation
- Energy types and energy mix
- Basics. Thermodynamics relevant to the energy sector
- Conventional fossil-fired power plants
- Combined Cycle Power Plants
- Cogeneration
- Nuclear energy
- Regenerative energies: hydropower, wind energy, solar energy, other energy systems
- Energy demand structures. Basics of economic efficiency and calculus. Optimization
- Energy storage
- Transport of energy
- Power generation and environment. Future of the energy industry

Workload
lectures: 45 h

preparation to exam: 195 h

V **Fundamentals of Energy Technology** **Lecture (V)**
3190923, SS 2019, 3 SWS, Language: English, Open in study portal

Learning Content
The following relevant fields of the energy industry are covered:
- Energy forms
- Thermodynamics relevant to energy industry
- Energy sources: fossil fuels, nuclear energy, renewable sources
- Energy industry in Germany, Europe and worldwide
- Power generation and environment
- Evaluation of energy conversion processes
- Thermal/electrical power plants and processes
- Transport of energy / energy carriers
- Energy storage
- Systems utilizing renewable energy sources
- Basics of economic efficiency and calculus / Optimisation
- Future of the energy industry

Workload
lectures: 45 h

preparation to exam: 195 h

T 9.51 Course: Fundamentals on High Frequency Techniques [T-ETIT-101955]

Responsible: Prof. Dr.-Ing. Thomas Zwick
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-102129 - Fundamentals on High Frequency Techniques

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	4

Exams				
SS 2019	7308406	Fundamentals on High Frequency Techniques	Prüfung (PR)	Zwick

Prerequisites
none

T 9.52 Course: Heat and Mass Transfer [T-MACH-105292]

Responsible: Prof. Dr.-Ing. Henning Bockhorn
Prof. Dr. Ulrich Maas

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	4	Each term	1

Events					
SS 2019	3122512	Heat and Mass Transfer	2 SWS	Lecture (V)	Bockhorn
WS 19/20	2165512	Heat and mass transfer	2 SWS	Lecture (V)	Maas
Exams					
SS 2019	76-T-MACH-105292	Heat and Mass Transfer		Prüfung (PR)	Maas

Competence Certificate
Written exam, 3 h

Prerequisites
none

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

V Heat and mass transfer
2165512, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content

- Steady and unsteady heat transfer in homogenous materials; Plates, pipe sections and sperical 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 (ceondensation, evaporation)
- Radiative heat transfer

Annotation
Compulsory elective subject: 5 LP

Workload
General attendance: 22.5 h

Self-study: 97.5 h

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

T 9.53 Course: Human-Machine-Interaction [T-INFO-101266]

Responsible: Prof. Dr.-Ing. Michael Beigl
Organisation: KIT Department of Informatics
Part of: M-INFO-100729 - Human Computer Interaction

Type	Credits	Recurrence	Version
Written examination	6	Each summer term	2

Events					
SS 2019	24659	Human-Computer-Interaction	2 SWS	Lecture (V)	Beigl
Exams					
SS 2019	7500048	Human-Machine-Interaction		Prüfung (PR)	Beigl
WS 19/20	7500076	Human-Machine-Interaction		Prüfung (PR)	Beigl

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-INFO-106257 - Human-Machine-Interaction Pass must have been passed.

T 9.54 Course: Human-Machine-Interaction in Anthropomatics: Basics [T-INFO-101361]

Responsible: Prof. Dr.-Ing. Jürgen Beyerer
Dr. Jürgen Geisler

Organisation: KIT Department of Informatics

Part of: M-INFO-100824 - Human-Machine-Interaction in Anthropomatics: Basics

Type	Credits	Recurrence	Version
Written examination	3	Each winter term	2

Events					
WS 19/20	24100	Human-Machine-Interaction in Anthropomatics: Basics	2 SWS	Lecture (V)	Geisler
Exams					
SS 2019	7500005	Human-Machine-Interaction in Anthropomatics: Basics		Prüfung (PR)	Beyerer, Geisler
WS 19/20	7500017	Human-Machine-Interaction in Anthropomatics: Basics		Prüfung (PR)	Beyerer, Geisler

T 9.55 Course: Human-Machine-Interaction Pass [T-INFO-106257]

Responsible: Prof. Dr.-Ing. Michael Beigl
Organisation: KIT Department of Informatics
Part of: M-INFO-100729 - Human Computer Interaction

Type	Credits	Recurrence	Version
Completed coursework	0	Each summer term	1

Events					
SS 2019	2400095	Human-Computer-Interaction	1 SWS	Practice (Ü)	Beigl, Exler
SS 2019	24659	Human-Computer-Interaction	2 SWS	Lecture (V)	Beigl
Exams					
SS 2019	7500121	Human-Machine-Interaction		Prüfung (PR)	Beigl

T 9.56 Course: Hybrid and Electric Vehicles [T-ETIT-100784]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100514 - Hybrid and Electric Vehicles

Type	Credits	Recurrence	Version
Written examination	4	Each winter term	1

Events					
WS 19/20	2306321	Hybrid and Electric Vehicles	2 SWS	Lecture (V)	Doppelbauer
WS 19/20	2306323	Tutorial for 2306323 Hybrid and Electric Vehicles	1 SWS	Practice (Ü)	Doppelbauer
Exams					
SS 2019	7306321	Hybrid and Electric Vehicles		Prüfung (PR)	Doppelbauer

Prerequisites
none

9.57 Course: Information Processing in Sensor Networks [T-INFO-101466]

Responsible: Prof. Dr.-Ing. Uwe Hanebeck
Organisation: KIT Department of Informatics
Part of: M-INFO-100895 - Information Processing in Sensor Networks

Type	Credits	Recurrence	Version
Oral examination	6	Irregular	1

Events					
WS 19/20	24102	Information Processing in Sensor Networks	3 SWS	Lecture (V)	Noack, Mayer, Hanebeck
Exams					
SS 2019	7500011	Information Processing in Sensor Networks		Prüfung (PR)	Hanebeck, Noack
WS 19/20	7500030	Information Processing in Sensor Networks		Prüfung (PR)	Noack, Hanebeck

T 9.58 Course: Information Technology I [T-ETIT-109300]

Responsible: Prof. Dr.-Ing. Eric Sax
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104539 - information technology

Type	Credits	Recurrence	Version
Written examination	4	Each summer term	1

Events					
SS 2019	2311651	Information Technology I	2 SWS	Lecture (V)	Sax
Exams					
SS 2019	7311651	Information Technology I		Prüfung (PR)	Sax

Competence Certificate
Einer schriftlichen Prüfung nach im Umfang von 120 Minuten zu den Lehrveranstaltungen Vorlesung, Übung.

T 9.59 Course: Information Technology I - Practical Course [T-ETIT-109301]

Responsible: Prof. Dr.-Ing. Eric Sax
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104539 - information technology

Type	Credits	Recurrence	Version
Completed coursework	2	Each summer term	1

Events					
SS 2019	2311653	Informationstechnik I – Praktikum	1 SWS	Practical course (P)	Sax
Exams					
SS 2019	7311653	Information Technology I - Practical course		Prüfung (PR)	Sax

Competence Certificate
Einer Erfolgskontrolle in Form von Projektdokumentationen und Kontrolle des Quellcodes im Rahmen der Lehrveranstaltung Praktikum.

T 9.60 Course: Information Technology II and Automation Technology [T-ETIT-109319]

Responsible: Prof. Dr.-Ing. Eric Sax
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104547 - Information Technology II and Automation Technology

Type	Credits	Recurrence	Expansion	Version
Written examination	4	Each summer term	1 terms	1

Events					
SS 2019	2311654	Information Technology II and Automation Technology	2 SWS	Lecture (V)	Sax
SS 2019	2311655	Übungen zu 2311654 Informationstechnik II und Automatisierungstechnik	1 SWS	Practice (Ü)	Brenner
Exams					
SS 2019	7311654	Information Technology II and Automation Technology		Prüfung (PR)	Sax

Competence Certificate
Einer schriftlichen Prüfung nach im Umfang von 120 Minuten zu den Lehrveranstaltungen Vorlesung, Übung.

T 9.61 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-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Oral examination	4	Each summer term	2

Events					
SS 2019	2121001	Integrated Information Systems for engineers	3 SWS	Lecture / Practice (VÜ)	Ovtcharova, Mitarbeiter
Exams					
SS 2019	76-T-MACH-102083	Integrated Information Systems for Engineers		Prüfung (PR)	Ovtcharova, Elstermann

Competence Certificate
Oral examination 20 min.

Prerequisites
None

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

V Integrated Information Systems for engineers
2121001, SS 2019, 3 SWS, Language: German, Open in study portal

Lecture / Practice (VÜ)

Learning Content

- Information systems, information management
- CAD, CAP and CAM systems
- PPS, ERP and PDM systems
- Knowledge management and ontology
- Process modeling

Workload
Regular attendance: 31,5 hours, self-study: 108 hours

Literature
Lecture slides

T 9.62 Course: Internship [T-MACH-108803]

Responsible: Prof. Dr. Martin Doppelbauer
Prof. Dr.-Ing. Peter Gratzfeld

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104265 - Internship

Type	Credits	Recurrence	Version
Completed coursework	15	Each term	1

Exams				
SS 2019	76-T-MACH-108803	Internship	Prüfung (PR)	Gratzfeld
WS 19/20	76-T-MACH-108803	Internship	Prüfung (PR)	Gratzfeld, Doppelbauer

Competence Certificate

An internship of at least thirteen weeks has to be fulfilled, which is suitable to provide the student an insight into the professionell work in the area of mechatronics and information technology. 15 ECTS are allocated to the intership.

Original certificates and reports about the internship has to be provided to the appropriate internship office.

The reports have to contain a compilation of activities during the internship with the following content:
company, area of production, workshop or department, instruction period in each workshop or department with start and end date and one detailed report per week or project. The report hast to consist of at least one DIN A4 page per week and should have the format of a scientific report. The reports should give evidence, that the author has done all reported activities by himself, for example by describing the work flow or reflecting the gained experience. Sketches, drawings, schematics etc. can save a long report.

The reports have to be checked by the supervisor in the company and have to be approved by stamp and signature. Periods which are not verified by a report cannot be accredited.

Prerequisites

None

Annotation

Further information are provided by the internship guidlines for the BSc-course in Mechatronics and Information Technology.

T 9.63 Course: Introduction into the Multi-Body Dynamics [T-MACH-105209]

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

Part of: M-MACH-103205 - Engineering Mechanics
M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	5	Each summer term	2

Events					
SS 2019	2162235	Introduction into the multi-body dynamics	3 SWS	Lecture (V)	Seemann
Exams					
SS 2019	76-T-MACH-105209	Introduction into the Multi-Body Dynamics		Prüfung (PR)	Seemann

Competence Certificate
Written examination, 180 min.

Prerequisites
none

Recommendation
Engineering Mechanics III/IV

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

V Introduction into the multi-body dynamics
2162235, SS 2019, 3 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content
The role of multibody systems in engineering, kinematics of a single rigid body, Kinematics of multibody systems, rotation matrix, angular velocity, derivatives in different reference systems, holonomic and non-holonomic constraints, Newton-Euler's equations, principle of d'Alembert, principle of virtuel power, Lagrange's equations, Kane's equations, structure of the equations of motion

Workload
time of attendance: 21,5h; self-study: 98h

Literature
Wittenburg, J.: Dynamics of Systems of Rigid Bodies, Teubner Verlag, 1977
Roberson, R. E., Schwertassek, R.: Dynamics of Multibody Systems, Springer-Verlag, 1988
de Jal'on, J. G., Bayo, E.: Kinematik and Dynamic Simulation of Multibody System.
Kane, T.: Dynamics of rigid bodies.

T 9.64 Course: Introduction to Microsystem Technology I [T-MACH-105182]

Responsible: Dr. Vlad Badilita
Dr. Mazin Jouda
Prof. Dr. Jan Gerrit Korvink

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102691 - Introduction to Microsystem Technology I

Type	Credits	Recurrence	Version
Written examination	4	Each winter term	1

Events					
WS 19/20	2141861	Introduction to Microsystem Technology I	2 SWS	Lecture (V)	Korvink, Badilita
Exams					
SS 2019	76-T-MACH-105182	Introduction to Microsystem Technology I		Prüfung (PR)	Korvink, Badilita

Competence Certificate
written examination for implementation in a major field, 30 min oral exam for elective subject

Prerequisites
none

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

V Introduction to Microsystem Technology I

Lecture (V)

2141861, WS 19/20, 2 SWS, Language: English, Open in study portal

Learning Content
- Introduction in Nano- and Microtechnologies
- Silicon and processes for fabricating microelectronics circuits
- Basic physics background and crystal structure
- Materials for micromachining
- Processing technologies for microfabrication
- Silicon micromachining
- Examples

Workload
Literature: 20 h

Lessions: 21 h

Preparation and Review: 50 h

Exam preparation: 30 h

Literature
M. Madou
Fundamentals of Microfabrication
Taylor & Francis Ltd.; Auflage: 3. Auflage. 2011

T 9.65 Course: Introduction to Microsystem Technology II [T-MACH-105183]

Responsible: Dr. Mazin Jouda
Prof. Dr. Jan Gerrit Korvink

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102706 - Introduction to Microsystem Technology II

Type	Credits	Recurrence	Version
Written examination	4	Each summer term	1

Events					
SS 2019	2142874	Introduction to Microsystem Technology II	2 SWS	Lecture (V)	Korvink, Badilita
Exams					
SS 2019	76-T-MACH-105183	Introduction to Microsystem Technology II		Prüfung (PR)	Korvink, Badilita

Competence Certificate
written examination for major field, oral exam (30 min) for elective field

Prerequisites
none

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

V Introduction to Microsystem Technology II
2142874, SS 2019, 2 SWS, Language: English, Open in study portal

Lecture (V)

Learning Content
- Introduction in Nano- and Microtechnologies
- Lithography
- LIGA-technique
- Mechanical microfabrication
- Patterning with lasers
- Assembly and packaging
- Microsystems

Workload
Literature: 20 h

Lessions: 21 h

Preparation and Review: 50 h

Exam preparation: 30 h

Literature
M. Madou
Fundamentals of Microfabrication
Taylor & Francis Ltd.; Auflage: 3. Auflage. 2011

T 9.66 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-WIWI-101418 - Introduction to Operations Research

Type	Credits	Recurrence	Version
Written examination	9	see Annotations	1

Events					
SS 2019	2550040	Introduction to Operations Research I	2+2 SWS	Lecture (V)	Stein
WS 19/20	2530043	Introduction to Operations Research II	2 SWS	Lecture (V)	Stein
WS 19/20	2530044		2 SWS	Tutorial (Tu)	Assistenten, Stein
Exams					
SS 2019	7900135	Introduction to Operations Research I and II		Prüfung (PR)	Nickel

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 July), one examination is held for both courses.

The overall grade of the module is the grade of the written examination.

Prerequisites
None

Recommendation
Mathematics I und II. Programming knowledge for computing exercises.

It is strongly recommended to attend the course *Introduction to Operations Research I* [2550040] before attending the course*Introduction to Operations Research II* [2530043].

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

V Introduction to Operations Research I

2550040, SS 2019, 2+2 SWS, Language: German, Open in study portal

Lecture (V)

Description
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 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, multicriteria optimization.

Graphs and Networks: Basic notions of graph theory, shortest paths in networks, project scheduling, maximal flows in networks.

Workload
Berechnung des Arbeitsaufwands eines durchschnittlichen Studenten um die Lernziele zu erreichen. (Intern)

Eine Vernetzung von learningoutcomes (Wissen (content), Kompetenzen (skills) und levels mit dem dafür geschätzten Arbeitsaufwand eines durchschnittlichen Studenten ist anzustreben.

Literature

- Nickel, Stein, Waldmann: Operations Research, 2nd edition, 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

T 9.67 Course: Introduction to Video Analysis [T-INFO-101273]

Responsible: Prof. Dr.-Ing. Jürgen Beyerer
Organisation: KIT Department of Informatics
Part of: M-INFO-100736 - Introduction to Video Analysis

Type	Credits	Recurrence	Version
Oral examination	3	Each summer term	1

Events					
SS 2019	24684	Introduction to Video Analysis	2 SWS	Lecture (V)	Arens
Exams					
SS 2019	7500031	Introduction to Video Analysis		Prüfung (PR)	Beyerer, Arens
WS 19/20	7500099	Introduction to Video Analysis		Prüfung (PR)	Beyerer, Arens

T 9.68 Course: Lab Course Electrical Drives and Power Electronics [T-ETIT-100718]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100401 - Lab Course Electrical Drives and Power Electronics

Type	Credits	Recurrence	Version
Oral examination	6	Each summer term	1

Events					
SS 2019	2306331	Lab Course Electrical Drives and Power Electronics	4 SWS	Practical course (P)	Becker
Exams					
SS 2019	7306331	Lab Course Electrical Drives and Power Electronics		Prüfung (PR)	Becker

Prerequisites
none

T 9.69 Course: Lab Course Electrical Power Engineering [T-ETIT-100728]

Responsible: Dr.-Ing. Rainer Badent
Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100419 - Lab Course Electrical Power Engineering

Type	Credits	Recurrence	Version
Oral examination	6	Each winter term	1

Events					
WS 19/20	2307398	Lab Course Electrical Power Engineering	4 SWS	Practical course (P)	Badent, Becker

Prerequisites
none

9.70 Course: Laboratory Adaptive Sensor Electronics [T-ETIT-100758]

Responsible: Prof. Dr. Michael Siegel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100469 - Laboratory Adaptive Sensor Electronics

Type	Credits	Recurrence	Version
Examination of another type	6	Each term	1

Events					
SS 2019	2312672	Laboratory Adaptive Sensor Electronics	4 SWS	Practical course (P)	Wünsch
WS 19/20	2312672	Laboratory Adaptive Sensor Electronics	4 SWS	Practical course (P)	Siegel, Wünsch
Exams					
SS 2019	7312672	Laboratory Adaptive Sensor Electronics		Prüfung (PR)	Siegel
WS 19/20	7312672	Laboratory Adaptive Sensor Electronics		Prüfung (PR)	Siegel

Prerequisites
none

T 9.71 Course: Laboratory Biomedical Engineering [T-ETIT-101934]

Responsible: Prof. Dr. Werner Nahm
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100389 - Laboratory Biomedical Engineering

Type	Credits	Recurrence	Version
Examination of another type	6	Each summer term	3

Events					
SS 2019	2305276	Laboratory Biomedical Engineering	4 SWS	Practical course (P)	Nahm
Exams					
SS 2019	7305276	Laboratory Biomedical Engineering		Prüfung (PR)	Nahm

Prerequisites
Passed exam of the module "Biomedizinische Messtechnik I".

Modeled Conditions
You have to fulfill one of 2 conditions:

1. The course T-ETIT-106492 - Biomedical Measurement Techniques I must have been passed.
2. The course T-ETIT-101928 - Biomedical Measurement Techniques I must have been passed.

T 9.72 Course: Laboratory Circuit Design [T-ETIT-100788]

Responsible: Prof. Dr.-Ing. Jürgen Becker
Dr.-Ing. Oliver Sander

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-100518 - Laboratory Circuit Design

Type	Credits	Version
Examination of another type	6	1

Events					
WS 19/20	2311638	Laboratory Circuit Design	4 SWS	Practical course (P)	Becker

Prerequisites
none

T 9.73 Course: Laboratory for Applied Machine Learning Algorithms [T-ETIT-109839]

Responsible: Prof. Dr.-Ing. Jürgen Becker
Prof. Dr.-Ing. Eric Sax
Prof. Dr. Wilhelm Stork

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-104823 - Laboratory for Applied Machine Learning Algorithms

Type	Credits	Recurrence	Expansion	Version
Examination of another type	6	Each term	1 terms	1

Events					
SS 2019	2311650	Laboratory for Applied Machine Learning Algorithms	4 SWS	Practical course (P)	Sax, Stork, Becker
WS 19/20	2311650	Laboratory for Applied Machine Learning Algorithms	4 SWS	Practical course (P)	Sax, Stork, Becker
Exams					
SS 2019	7311650	Laboratory for Applied Machine Learning Algorithms		Prüfung (PR)	Sax, Stork, Becker

Prerequisites
none

T 9.74 Course: Laboratory Hardware and Software in Power Electronic Systems [T-ETIT-106498]

Responsible: Prof. Dr.-Ing. Marc Hiller
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-103263 - Laboratory Hardware and Software in Power Electronic Systems

Type	Credits	Recurrence	Version
Examination of another type	6	Each term	1

Events					
SS 2019	2306346	Laboratory Hardware and Software in Power Electronic Systems	4 SWS	Practical course (P)	Stoß, Stahl
WS 19/20	2306346	Laboratory Hardware and Software in Power Electronic Systems	4 SWS	Practical course (P)	Hiller, Stoß
Exams					
SS 2019	7306346	Laboratory Hardware and Software in Power Electronic Systems		Prüfung (PR)	Stoß, Becker

Prerequisites
The moduls "M-ETIT-100402 - Workshop Schaltungstechnik in der Leistungselektronik" and "M-ETIT-100404 - Workshop Mikrocontroller in der Leistungselektronik" may neither be started nor completed.

T 9.75 Course: Laboratory Mechatronic Measurement Systems [T-ETIT-106854]

Responsible: Prof. Dr.-Ing. Michael Heizmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-103448 - Laboratory Mechatronic Measurement Systems

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	1

Events					
WS 19/20	2302123	Laboratory Mechatronic Measurement Systems	4 SWS	Practical course (P)	Heizmann

Prerequisites
none

T 9.76 Course: Linear Electronic Networks [T-ETIT-109316]

Responsible: Prof. Dr. Olaf Dössel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104519 - Linear Electric Circuits
M-MACH-104333 - Orientation Exam

Type	Credits	Recurrence	Version
Written examination	7	Each winter term	1

Events					
WS 19/20	2305256	Linear Electric Circuits	4 SWS	Lecture (V)	Dössel, Pilia
WS 19/20	2305258	Linear Electric Circuits (Tutorial to 2305256)	1 SWS	Practice (Ü)	Pilia
Exams					
SS 2019	7305256	Linear Electronic Networks		Prüfung (PR)	Dössel

Prerequisites
none

9.77 Course: Linear Electronic Networks - Workshop A [T-ETIT-109317]

Responsible: Prof. Dr.-Ing. Thomas Leibfried
Prof. Dr. Ulrich Lemmer

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-104519 - Linear Electric Circuits
M-MACH-104333 - Orientation Exam

Type	Credits	Recurrence	Version
Completed coursework	1	Each winter term	2

Events					
WS 19/20	2307905	Linear Electric Circuits - Workshop A	1 SWS	Practical course (P)	Lemmer, Leibfried

Prerequisites
none

T 9.78 Course: Linear Electronic Networks - Workshop B [T-ETIT-109811]

Responsible: Prof. Dr. Olaf Dössel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104519 - Linear Electric Circuits
M-MACH-104333 - Orientation Exam

Type	Credits	Recurrence	Expansion	Version
Completed coursework	1	Each winter term	1 terms	1

Events					
WS 19/20	2307905	Linear Electric Circuits - Workshop A	1 SWS	Practical course (P)	Lemmer, Leibfried

T 9.79 Course: Machine Dynamics [T-MACH-105210]

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

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	5	Each summer term	1

Events					
SS 2019	2161224	Machine Dynamics	2 SWS	Lecture (V)	Proppe
SS 2019	2161225	Machine Dynamics (Tutorial)	1 SWS	Practice (Ü)	Proppe, Koebele
Exams					
SS 2019	76-T-MACH-105210	Machine Dynamics		Prüfung (PR)	Proppe

Competence Certificate
written exam, 180 min.

Prerequisites
none

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

V Machine Dynamics

2161224, SS 2019, 2 SWS, Language: English, Open in study portal

Lecture (V)

Learning Content
1. Introduction

2. Machine as mechatronic system
3. Rigid rotors: equations of motion, transient and stationary motion, balancing
4. Flexible rotors: Laval rotor (equations of motion, transient and stationary behavior, critical speed, secondary effects), refined models)
5. Slider-crank mechanisms: kinematics, equations of motion, mass and power balancing

Workload
Lectures and exercices: 32 h

Studies: 118 h

Literature
Biezeno, Grammel: Technische Dynamik, 2. Edition, 1953

Holzweißig, Dresig: Lehrbuch der Maschinendynamik, 1979

Dresig, Vulfson: Dynamik der Mechanismen, 1989

V Machine Dynamics (Tutorial)

2161225, SS 2019, 1 SWS, Language: English, Open in study portal

Practice (Ü)

Learning Content
Excercises related to the lecture

T 9.80 Course: Machine Tools and Industrial Handling [T-MACH-102158]

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

Part of: M-MACH-101286 - Machine Tools and Industrial Handling

Type	Credits	Recurrence	Version
Written examination	9	Each winter term	2

Events					
WS 19/20	2149902	Machine Tools and Industrial Handling	6 SWS	Lecture / Practice (VÜ)	Fleischer
Exams					
SS 2019	76-T-MACH-102158-MIT	Machine Tools and Industrial Handling		Prüfung (PR)	Fleischer
SS 2019	76-T-MACH-102158-WING	Machine Tools and Industrial Handling		Prüfung (PR)	Fleischer

Competence Certificate
Written exam (120 minutes)

Prerequisites
"T-MACH-109055 - Werkzeugmaschinen und Handhabungstechnik" must not be commenced.

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

V Machine Tools and Industrial Handling
2149902, WS 19/20, 6 SWS, Language: German, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

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

Notes

The lecture gives an overview of the construction, use and application of machine tools and industrial handling equipment. In the course of the lecture a well-founded and practice-oriented knowledge for the selection, design and evaluation of machine tools is conveyed. First, the main components of the machine tools are systematically explained and their design principles as well as the integral machine tool design are discussed. Subsequently, the use and application of machine tools will be demonstrated using typical machine examples. Based on examples from current research and industrial applications, the latest developments are discussed, especially concerning the implementation of Industry 4.0.

The individual topics are:

- Frames and frame components
- Feed axes
- Spindles
- Peripheral equipment
- Control unit
- Metrological evaluation and machine testing
- Process monitoring
- Maintenance of machine tools
- Safety assessment of machine tools
- Machine examples

Learning Outcomes:

The students ...

- are able to assess the use and application of machine tools and handling equipment and to differentiate between them in terms of their characteristics and design.
- can describe and discuss the essential elements of the machine tool (frame, main spindle, feed axes, peripheral equipment, control unit).
- are able to select and dimension the essential components of a machine tool.
- are capable of selecting and evaluating machine tools according to technical and economic criteria.

Workload:

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

Learning Content

The lecture gives an overview of the construction, use and application of machine tools and industrial handling equipment. In the course of the lecture a well-founded and practice-oriented knowledge for the selection, design and evaluation of machine tools is conveyed. First, the main components of the machine tools are systematically explained and their design principles as well as the integral machine tool design are discussed. Subsequently, the use and application of machine tools will be demonstrated using typical machine examples. Based on examples from current research and industrial applications, the latest developments are discussed, especially concerning the implementation of Industry 4.0.

The individual topics are:

- Frames and frame components
- Feed axes
- Spindles
- Peripheral equipment
- Control unit
- Metrological evaluation and machine testing
- Process monitoring
- Maintenance of machine tools
- Safety assessment of machine tools
- Machine examples

Annotation

None

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

T 9.81 Course: Mathematical Methods in Continuum Mechanics [T-MACH-110375]

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

Part of: M-MACH-103205 - Engineering Mechanics

Type	Credits	Recurrence	Expansion	Version
Written examination	4	Each winter term	1 terms	1

Events					
WS 19/20	2161254	Mathematical Methods in Continuum Mechanics	2 SWS	Lecture (V)	Böhlke

Competence Certificate
written exam (90 min). Additives as announced.

Prerequisites
Passing the Tutorial to Mathematical Methods of Continuum Mechanics (T-MACH-110376)

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-110376 - Tutorial Mathematical Methods in Continuum Mechanics must have been passed.

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

V Mathematical Methods in Continuum Mechanics

2161254, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Notes
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

Learning Content
Tensor algebra

- vectors; basis transformation; dyadic product; tensors of 2nd order
- properties of 2nd order tensors: symmetry, anti-symmetry, orthogonality etc.
- eigenvalue problem, theorem of Cayley-Hamilton, invariants; tensors of higher order
- tensor algebra in curvilinear coordinate systems
- tensor analysis in curvilinear coordinate systems
- Differentiation of tensor functions

Application of tensor calculus in strength of materials

- kinematics of infinitesimal and finite deformations
- transport theorem, balance equations, stress tensor
- constitutive equations for solids and fluids
- Formulation of initial-boundary-value problems

Workload
regular attendance: 31,5 hours
self-study: 88,5 hours

Literature
lecture notes
Bertram, A.: Elasticity and Plasticity of Large Deformations - an Introduction. Springer 2005.
Liu, I-S.: Continuum Mechanics. Springer, 2002.
Schade, H.: Tensoranalysis.Walter de Gruyter, New York, 1997.
Wriggers, P.: Nichtlineare Finite-Element-Methoden. Springer, 2001.

T 9.82 Course: Mathematical Methods in Dynamics [T-MACH-105293]

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

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	2

Events					
WS 19/20	2161206	Mathematical Methods in Dynamics	2 SWS	Lecture (V)	Proppe
WS 19/20	2161207	Übungen zu Mathematische Methoden der Dynamik	1 SWS	Practice (Ü)	Oestringer, Proppe

Competence Certificate
written examination, 180 min.

Prerequisites
none

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

V Mathematical Methods in Dynamics

2161206, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content
Dynamics of continua:
Concept of continuum, geometry of continua, kinematics and kinetics of continua

Dynamics of rigid bodies:
Kinematics and kinetics of rigid bodies

Variational principles:
Priniciple of virtual work, variational calculations, Principle of Hamilto

Approximate solution methods:
Methods of weighted residuals, method of Ritz

Applications

Workload
Lectures and exercices: 32 h

Studies: 148 h

Literature
Lecture notes (available online)

J.E. Marsden, T.J.R. Hughes: Mathematical foundations of elasticity, New York, Dover, 1994

P. Haupt: Continuum mechanics and theory of materials, Berlin, Heidelberg, 2000

M. Riemer: Technische Kontinuumsmechanik, Mannheim, 1993

K. Willner: Kontinuums- und Kontaktmechanik : synthetische und analytische Darstellung, Berlin, Heidelberg, 2003

J.N. Reddy: Energy Principles and Variational Methods in applied mechanics, New York, 2002

A. Boresi, K.P. Chong, S. Saigal: Approximate solution methods in engineering mechanics, New York, 2003

V **Übungen zu Mathematische Methoden der Dynamik** **Practice (Ü)**
2161207, WS 19/20, 1 SWS, Language: German, Open in study portal

Learning Content
Excercises related to the lecture

T 9.83 Course: Mathematical Methods in Fluid Mechanics [T-MACH-105295]

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

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	6	Each summer term	1

Events					
SS 2019	2154432	Mathematical Methods in Fluid Mechanics	2 SWS	Lecture (V)	Frohnapfel, Stroh, Gatti
SS 2019	2154433	Tutorial in Mathematical Methods of Fluid Mechanics	1 SWS	Practice (Ü)	Frohnapfel, Stroh, Gatti
SS 2019	2154540	Mathematical Methods in Fluid Mechanics	SWS	Lecture (V)	Magagnato
Exams					
SS 2019	76-T-MACH-105295	Mathematical Methods in Fluid Mechanics		Prüfung (PR)	Frohnapfel, Gatti
WS 19/20	76-T-MACH-105295	Mathematical Methods in Fluid Mechanics		Prüfung (PR)	Frohnapfel

Competence Certificate
written examination - 3 hours

Prerequisites
none

Recommendation
Basic Knowledge about Fluid Mechanics

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

V Mathematical Methods in Fluid Mechanics
Lecture (V)
2154432, SS 2019, 2 SWS, Language: German/English, Open in study portal

Description
Media:

chalk board, Power Point

Notes
The students can to simplify the Navier-Stokes equations for specific flow problems. They are able to employ mathematical method in fluid mechanics effectively in order to solve the resulting conservation equations analytically, if possible, or to enable simpler numerical access to the problem. They 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:

- Potential flow theory
- Creeping flows
- Lubrication theory
- Boundary-layer theory
- Laminar-turbulent transition (linear stability theory)
- Turbulent flows
- Numerical solution of the governing equation (finite difference methods)

The students can to simplify the Navier-Stokes equations for specific flow problems. They are able to employ mathematical method in fluid mechanics effectively in order to solve the resulting conservation equations analytically, if possible, or to enable simpler numerical access to the problem. They can describe the limits of applicability of the assumptions made to model the flow behavior.

Learning Content
The lecture will cover a selection of the following topics:

- Potential flow theory
- Creeping flows
- Lubrication theory
- Boundary-layer theory
- Laminar-turbulent transition (linear stability theory)
- Turbulent flows
- Numerical solution of the governing equation (finite difference methods)

Workload
regular attendance: 30 hours
self-study: 150 hours

Literature
Kundu, P.K., Cohen, K.M.: Fluid Mechanics, Elsevier, 4th Edition, 2008

Batchelor, G.K.: An Introduction to Fluid Dynamics, Cambridge Mathematical Library, 2000

Pope, S. B.: Turbulent Flows, Cambridge University Press, 2000

Ferziger, H., Peric, M.: Computational Methods for Fluid Dynamics, Springer, 2008

V **Tutorial in Mathematical Methods of Fluid Mechanics** **Practice (Ü)**
2154433, SS 2019, 1 SWS, Language: German, Open in study portal

Description
Media:

chalk board, Power Point

Notes
The exercises will practise the lecture topics:

- Curvilinear coordinates and tensor calculus
- Potential flow theory
- Boundary-layer theory
- Laminar-turbulent transition (linear stability theory)
- Turbulent flows
- Numerical solution of the governing equation (finite difference methods)

Learning Content
The exercises will practise the lecture topics:

- Curvilinear coordinates and tensor calculus
- Potential flow theory
- Boundary-layer theory
- Laminar-turbulent transition (linear stability theory)
- Turbulent flows
- Numerical solution of the governing equation (finite difference methods)

Workload
regular attendance: 10,5 hours
self-study: 49,5 hours

Literature
Kundu, P.K., Cohen, K.M.: Fluid Mechanics, Elsevier, 4th Edition, 2008

Batchelor, G.K.: An Introduction to Fluid Dynamics, Cambridge

Mathematical Library, 2000

Boiko, A. V., Grek, G. R., Dovgal, A. V., Kozlov, V. V.: The Origin of Turbulence in Near-Wall Flows, Springer, 2002

Pope, S. B.: Turbulent Flows, Cambridge University Press, 2000

Ferziger, H., Peric, M.: Computational Methods for Fluid Dynamics, Springer, 2008

T 9.84 Course: Mathematical Methods in Strength of Materials [T-MACH-100297]

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

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	5	Each winter term	4

Competence Certificate
written exam (90 min). Additives as announced.

Prerequisites
Passing the Tutorial to Mathematical Methods of Strength of Materials

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-106830 - Tutorial Mathematical Methods in Strength of Materials must have been passed.

T 9.85 Course: Mathematical Methods of Vibration Theory [T-MACH-105294]

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

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	6	Each summer term	2

Events					
SS 2019	2162241	Mathematical methods of vibration theory	2 SWS	Lecture (V)	Seemann
SS 2019	2162242	Mathematical methods of vibration theory (Tutorial)	2 SWS	Practice (Ü)	Seemann, Burgert
Exams					
SS 2019	76-T-MACH-105294	Mathematical Methods of Vibration Theory		Prüfung (PR)	Seemann

Competence Certificate
written examination, 180 min.

Prerequisites
none

Recommendation
Engineering Mechanics III/IV

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

V Mathematical methods of vibration theory
Lecture (V)
2162241, SS 2019, 2 SWS, Language: German, Open in study portal

Learning Content
Linear, time-invariant, ordinary single differential equations: homogeneous solution; harmonic, periodic and non-periodic excitations; Duhamel's integral; Fourier and Laplace transform; introduction into the theory of distributions; Systems of ordinary differential equations: matrix notation, eigenvalue theory, fundamental matrix, forced vibrations via modal expansion and transition matrix; Introduction into the dynamic stability theory; Partial differential equations: solution in product form, eigenvalue theory, modal expansion using Ritz series; Variational methods, Hamilton's principle, boundary value problems representing vibrating continua; Perturbation methods

Workload
time of attendance: 24h; self-study: 65h

Literature
Riemer, Wedig, Wauer: Mathematische Methoden der Technischen Mechanik

V Mathematical methods of vibration theory (Tutorial)
Practice (Ü)
2162242, SS 2019, 2 SWS, Language: German, Open in study portal

Learning Content
Seven tutorials with examples of the contents of the course

Workload
time of attendance: 10,5h; self-study: 20h

Literature

Riemer, Wedig, Wauer: Mathematische Methoden der Technischen Mechanik

T 9.86 Course: Mechanical Design Basics I and II [T-MACH-110363]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-101299 - Mechanical Design

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	1

Events					
SS 2019	2146131	Mechanical Design Basics II	2 SWS	Lecture (V)	Albers, Matthiesen
WS 19/20	2145131	Mechanical Design Basics I	2 SWS	Lecture (V)	Albers, Matthiesen, Behrendt

Competence Certificate
Written Exam (90min) on the topics of MKLGI and MKLGII.

Prerequisites
The bricks "T-MACH-110364 - Mechanical Design Basics I, Tutorial" and "T-MACH-110365 - Mechanical Design Basics II, Tutorial" must be passed successfully.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-110364 - Mechanical Design Basics I, Tutorial must have been passed.
2. The course T-MACH-110365 - Mechanical Design Basics II, Tutorial must have been passed.

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

V Mechanical Design Basics II

2146131, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Description
Media:

Beamer

Visualizer

Mechanical components

Notes

Design

Dimensioning

Component connections

Bolted connection

Prerequisites:

MIT:

In a workshop with 3 project sessions the students will be divided into groups and their knowledge will be tested. Attendance in all 3 project sessions is compulsory and is checked. In colloquia the knowledge from the lecture will be tested at the beginning of the project sessions. The successful completion of the colloquia as well as the completion of the workshop task is a prerequisite for successful participation.

CIW/ VT/ IP-M/ WiING / NWT/ MATH/ MWT:

During the lecture, students must apply the knowledge from MKL I and II to a design task. This is then evaluated and must be passed for successful participation.

Workload:

Presence time: 21 h

Self study: 51 h

Learning Content

Sealings

Design

Dimensioning

Component connections

Bolt connection

Tutorials take place in concomitant to the lectures.

Annotation

Lecture notes:

The Productdevelopment knowledge base PKB will be provided in digital form for registered students. All lecture notes and additional slides will be provided in Ilias.

Workload

regular attendance: 42 h

self-study: 80 h

Literature

Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X ,

also available as electronic paper at the KIT catalogue.

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8)

V **Mechanical Design Basics I** **Lecture (V)**
2145131, WS 19/20, 2 SWS, Language: German, Open in study portal

Description

Media:

Beamer

Visualizer

Mechanical components

Learning Content

Introduction in product engineering

Tools of visualization (technical drawing)

Product manufacturing as problem solving

Product manufacturing of technical systems:

- system theory
- Contact and Channel C&C²-A

Basics of chosen design- and machining elements

- springs
- bearings
- sealings

Concommitant to the lectures tutorials take place with the following contents:

Gear workshop

Tutorial "tools of visualization (technical drawing)"

Tutorial "technical systems product development, sytem theory, Contact and Chanel C&C²-A"

Tutorial "springs"

Tutorial "bearing and bearing arrangements"

Annotation

Lecture notes:

The Productdevelopment knowledge base PKB will be provided in digital form for registered students. All lecture notes and additional slides will be provided in Ilias.

Workload

regular attendance: 42 h

self-study: 80 h

Literature

Lecture notes:

The lecture notes can be downloaded via the eLearning platform Ilias.

Literature:

Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

or per full text access provided by university library

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

T 9.87 Course: Mechanical Design Basics I, Tutorial [T-MACH-110364]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-101299 - Mechanical Design

Type	Credits	Recurrence	Version
Completed coursework	1	Each winter term	1

Events					
WS 19/20	2145132	Tutorials Mechanical Design Basics I	1 SWS	Practice (Ü)	Albers, Matthiesen, Behrendt, Mitarbeiter

Competence Certificate
To pass the preliminary work, attendance at 3 workshop sessions of the MKL1 transmission workshop and the passing of a colloquium at the beginning of each workshop are prerequisites.

Prerequisites
None

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

V Tutorials Mechanical Design Basics I

Practice (Ü)

2145132, WS 19/20, 1 SWS, Language: German, Open in study portal

Description
Media:

Beamer

Visualizer

Gear box (Workshop)

Learning Content
Gear workshop

Tutorial "tools of visualization (technical drawing)"

Tutorial "technical systems product development, sytem theory, element model C&CM"

Tutorial "springs"

Tutorial "bearing and bearing arrangements"

Literature
Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

T 9.88 Course: Mechanical Design Basics II, Tutorial [T-MACH-110365]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-101299 - Mechanical Design

Type	Credits	Recurrence	Version
Completed coursework	1	Each summer term	1

Events					
SS 2019	2146132	Tutorials Mechanical Design Basics II	2 SWS	Practice (Ü)	Albers, Matthiesen, Mitarbeiter

Competence Certificate

CIW/ VT/ IP-M/ WiING / NWT/ MATH/ MWT: For passing the prerequisite it is necessary that a design task is successfully completed as a technical hand drawing

MIT: To pass the preliminary examination, attendance at workshop sessions and a colloquium at the beginning of each workshop are required.

Prerequisites

None

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

V Tutorials Mechanical Design Basics II — Practice (Ü)

2146132, SS 2019, 2 SWS, Language: German, Open in study portal

Description

Media:

Beamer

Visualizer

Notes

Design

Dimensioning

Component connections

Bolted connection

Workload:

MIT Students:

Presence time: 18 h

Self study: 30 h

CIW/ VT/ IP-M/ WiING / NWT/ MATH/ MWT

Presence time: 10,5 h

Self study: 37,5 h

Learning Content

Bearings

Sealings

Design

Tolerances and fittings

Shaft-hub connections

Literature

Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

T 9.89 Course: Mechanical Design III & IV [T-MACH-104810]

Responsible: Prof. Dr.-Ing. Albert Albers
Norbert Burkardt
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102829 - Mechanical Design III+IV

Type	Credits	Recurrence	Version
Written examination	13	Each winter term	2

Events					
SS 2019	2146177	Mechanical Design IV	2 SWS	Lecture (V)	Albers, Matthiesen
SS 2019	3146020	Mechanical Design IV Lecture	2 SWS	Lecture (V)	Albers, Burkardt
WS 19/20	2145151	Mechanical Design III	2 SWS	Lecture (V)	Albers, Matthiesen, Mitarbeiter
WS 19/20	3145016	Mechanical Design III (Lecture)	2 SWS	Lecture (V)	Albers, Burkardt
Exams					
SS 2019	76-T-MACH-104810	Mechanical Design III & IV		Prüfung (PR)	Albers, Matthiesen

Competence Certificate
written exam consisting of:

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

Sum: 240 min

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

Modeled Conditions
You have to fulfill one of 2 conditions:

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

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

V Mechanical Design III — Lecture (V)
2145151, WS 19/20, 2 SWS, Language: German, Open in study portal

Description
Media:

Beamer

Visualizer

Mechanical components

Learning Content
component connection

Tolerances and fittings

gears

Annotation

Lecture notes:

The Productdevelopment knowledge base PKB will be provided in digital form for registered students. All lecture notes and additional slides will be provided in Ilias.

Workload

regular attendance: 42 h

self-study: 80 h

Literature

Lecture notes:

The lecture notes can be downloaded via the eLearning platform Ilias.

Literature:

Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

or per full text access provided by university library

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3(für Fortgeschrittene)

V **Mechanical Design III (Lecture)** **Lecture (V)**

3145016, WS 19/20, 2 SWS, Language: English, Open in study portal

Description

Media:

Beamer

Visualizer

Mechanical components

Learning Content

component connection

Tolerances and fittings

gears

Annotation

Lecture notes:

The Productdevelopment knowledge base PKB will be provided in digital form for registered students. All lecture notes and additional slides will be provided in Ilias.

Workload

regular attendance: 42 h

self-study: 80 h

Literature

Lecture notes:

The lecture notes can be downloaded via the eLearning platform Ilias.

Literature:

Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

or per full text access provided by university library

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3(für Fortgeschrittene)

T 9.90 Course: Mechanical Design III, Constructing the Team [T-MACH-105284]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102829 - Mechanical Design III+IV

Type	Credits	Recurrence	Version
Completed coursework	0	Each winter term	2

Events					
WS 19/20	2145153	Tutorials Mechanical Design III	2 SWS	Practice (Ü)	Albers, Matthiesen, Mitarbeiter
WS 19/20	2145154	Mechanical Design III Workshop	1 SWS	Practical course (P)	Albers, Matthiesen, Albers Assistenten
WS 19/20	3145017	Mechanical Design III (Tutorial)	2 SWS	Practice (Ü)	Albers, Burkardt
WS 19/20	3145018	Mechanical Design III (Workshop)	SWS		Albers, Burkardt
Exams					
WS 19/20	76-T-MACH-105284	Mechanical Design III, Constructing with Team		Prüfung (PR)	Albers, Burkardt, Matthiesen

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

Prerequisites
None

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

V Tutorials Mechanical Design III

2145153, WS 19/20, 2 SWS, Language: German, Open in study portal

Practice (Ü)

Description
Media:

Beamer

Visualizer

model box (Workshop)

Learning Content
component connection

Tolerances and fittings

gears

Literature

Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

V Mechanical Design III Workshop

2145154, WS 19/20, 1 SWS, Open in study portal

Practical course (P)

Learning Content

Interrogation of the purchased knowledge in mechanical design by means of the workshop task.

Annotation

Bonus

The student can achieve an extra bonus for the mechanical design exam.

The bonus amounts to 0,3 exam points and it can only be achieved in case of passed MD-exam (lowest passing grade 4,0).

More details will be announced in mechanical design III and IV.

Workload

regular attendance: 21 h

self-study: 39 h

Literature

Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

V Mechanical Design III (Tutorial)

3145017, WS 19/20, 2 SWS, Language: English, Open in study portal

Practice (Ü)

Description

Media:

Beamer

Visualizer

model box (Workshop)

Learning Content

component connection

Tolerances and fittings

gears

Literature
Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

V Mechanical Design III (Workshop)

3145018, WS 19/20, SWS, Language: English, Open in study portal

Learning Content
Interrogation of the purchased knowledge in mechanical design by means of the workshop task.

Annotation
Bonus

The student can achieve an extra bonus for the mechanical design exam.

The bonus amounts to 0,3 exam points and it can only be achieved in case of passed MD-exam (lowest passing grade 4,0).

More details will be announced in mechanical design III.

Workload
regular attendance: 21 h

self-study: 39 h

Literature
Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

T 9.91 Course: Mechanical Design IV, Constructing the Team [T-MACH-105285]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102829 - Mechanical Design III+IV

Type	Credits	Recurrence	Version
Completed coursework	0	Each summer term	2

Events					
SS 2019	2146184	Tutorials Mechanical Design IV	2 SWS	Practice (Ü)	Albers, Matthiesen, Mitarbeiter
SS 2019	2146187	Workshop 'Mechanical Design IV'	1 SWS		Albers, Matthiesen, Mitarbeiter
SS 2019	3146021	Mechanical Design IV Tutorials	1 SWS	Practice (Ü)	Albers, Mitarbeiter
SS 2019	3146022	Mechanical Design IV Workshop	1 SWS		Albers, Mitarbeiter
Exams					
SS 2019	76-T-MACH-105285	Mechanical Design IV, Constructing the Team		Prüfung (PR)	Albers, Burkardt

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

Prerequisites
None

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

V Mechanical Design IV Tutorials

Practice (Ü)

3146021, SS 2019, 1 SWS, Language: English, Open in study portal

Notes
Basic connections - part 2

- Coupling fundamentals
- Dimensioning fundamentals
- Hydraulic fundamentals

V Mechanical Design IV Workshop

3146022, SS 2019, 1 SWS, Language: English, Open in study portal

Notes

Interrogation of the purchased knowledge in mechanical design by means of the workshop task.

The students are able to develop technical solutions in a team, to implement their ideas in technical solutions and to illustrate their own working- and decision process by using protocols and diagrams.

The students are able to:

- choose and design a functional clutch system.
- apply and conduct a stress analysis.
- design simple hydraulic facilities.
- make technical drawings.
- construct CAD- models with regard to the top-down method.

Literature

Konstruktionselemente des Maschinenbaus - 1 und 2
Grundlagen der Berechnung und Gestaltung von
Maschinenelementen;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X

Grundlagen von Maschinenelementen für Antriebsaufgaben;
Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

CAD:

3D-Konstruktion mit Pro/Engineer - Wildfire, Paul Wyndorps, Europa Lehrmittel, ISBN: 978-3-8085-8948-9

Pro/Engineer Tipps und Techniken, Wolfgang Berg, Hanser Verlag, ISBN: 3-446-22711-3 (für Fortgeschrittene)

T 9.92 Course: Mechano-Informatics and Robotics [T-INFO-101294]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Organisation: KIT Department of Informatics
Part of: M-INFO-100757 - Mechano-Informatics and Robotics

Type	Credits	Recurrence	Version
Written examination	4	Each winter term	1

Events					
WS 19/20	2400077	Mechano-Informatics and Robotics	2 SWS	Lecture (V)	Asfour, Kaul
Exams					
SS 2019	7500217	Nachprüfung: Mechano-Informatics and Robotics		Prüfung (PR)	Asfour
WS 19/20	7500176	Mechano-Informatics and Robotics		Prüfung (PR)	Asfour

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

V Mechano-Informatics and Robotics

2400077, WS 19/20, 2 SWS, Language: German/English, Open in study portal

Lecture (V)

Learning 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.

T 9.93 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-102749 - Mechatronical Systems and Products

Type	Credits	Recurrence	Version
Written examination	3	Each winter term	2

Events					
WS 19/20	2303003	Tutorial for 2303161 Mechatronical Systems and Products	1 SWS	Practice (Ü)	Schwartz, Hölz
WS 19/20	2303161	Mechatronical Systems and Products	2 SWS	Lecture (V)	Matthiesen, Hohmann

Competence Certificate
written examination (duration: 60min)

Prerequisites
Successful participation in the workshop Mechatronic Systems and Products is mandatory for admission to the examination.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-108680 - Workshop Mechatronical Systems and Products must have been passed.

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.

T 9.94 Course: Medical Imaging Techniques I [T-ETIT-101930]

Responsible: Prof. Dr. Olaf Dössel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100384 - Medical Imaging Techniques I

Type	Credits	Recurrence	Version
Written examination	3	Each winter term	1

Events					
WS 19/20	2305261	Medical Imaging Techniques I	2 SWS	Lecture (V)	Dössel

Prerequisites
none

T 9.95 Course: Methods and Processes of PGE - Product Generation Development [T-MACH-109192]

Responsible: Prof. Dr.-Ing. Albert Albers
Norbert Burkardt
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102718 - Product Development - Methods of Product Development

Type	Credits	Recurrence	Version
Written examination	6	Each summer term	1

Events					
SS 2019	2146176	Methods and processes of PGE - Product Generation Development	3 SWS	Lecture (V)	Albers
Exams					
SS 2019	76-T-MACH-105382	Product Development - Methods of Product Development		Prüfung (PR)	Albers
SS 2019	76-T-MACH-105382-en	Methods and Processes of PGE - Product Generation Engineering		Prüfung (PR)	Albers

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.

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

V Methods and processes of PGE - Product Generation Development

Lecture (V)

2146176, SS 2019, 3 SWS, Language: German, Open in study portal

Notes

Note:

This lecture is the basis for the main subject Integrated Product Development, which is offered as a specialisation.

Recommendations:

none

Workload:

regular attendance: 31.5 h

self-study: 148.5 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 differents methods of design of experiment.
- explain the costs in development process.

T 9.96 Course: Metrology in Mechatronics [T-ETIT-106432]

Responsible: Michael Heizmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-103242 - Metrology in Mechatronics

Type	Credits	Recurrence	Version
Written examination	5	Each winter term	1

Events					
WS 19/20	2302117	Measurement Technology in Mechatronics	2 SWS	Lecture (V)	Heizmann
WS 19/20	2302119	Übungen zu 2302117 Messtechnik in der Mechatronik	1 SWS	Practice (Ü)	Heizmann
Exams					
SS 2019	7302117	Metrology in Mechatronics		Prüfung (PR)	Heizmann

Prerequisites
none

T 9.97 Course: Microactuators [T-MACH-101910]

Responsible: Prof. Dr. Manfred Kohl
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-100487 - Microactuators

Type	Credits	Recurrence	Version
Written examination	4	Each summer term	2

Events					
SS 2019	2142881	Microactuators	2 SWS	Lecture (V)	Kohl
Exams					
SS 2019	76-T-MACH-101910	Microactuators		Prüfung (PR)	Kohl

Competence Certificate
written exam, 60 min.

Prerequisites
none

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

V Microactuators

2142881, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Description
Media:

Script of ppt-slides

Learning 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:

- Microelectromechnical systems: linear actuators, microrelais, micromotors
- Medical technology and life sciences: Microvalves, micropumps, microfluidic systems
- Microrobotics: Micrgrippers, polymer actuators (smart muscle)
- Information technology: Optical switches, mirror systems, read/write heads

Annotation
Details will be announced at the beginning of the lecture

Workload
lecture time 1.5 h/week

self preparation: 8.5 h/week

Literature

- Lecture notes
- 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, Cambride University Press 2010

T 9.98 Course: Microwave Laboratory I [T-ETIT-100734]

Responsible: Prof. Dr.-Ing. Thomas Zwick
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100425 - Microwave Laboratory I

Type	Credits	Recurrence	Version
Examination of another type	6	Each summer term	1

Events					
SS 2019	2308423	Microwave Laboratory I	4 SWS	Practical course (P)	Pauli
Exams					
SS 2019	7308423	Microwave Laboratory I		Prüfung (PR)	Zwick

Prerequisites
none

T 9.99 Course: Mobile Computing and Internet of Things [T-INFO-102061]

Responsible: Prof. Dr.-Ing. Michael Beigl
Organisation: KIT Department of Informatics
Part of: M-INFO-101249 - Mobile Computing and Internet of Things

Type	Credits	Recurrence	Version
Oral examination	5	Each winter term	1

Events					
WS 19/20	2400051	Mobile Computing and Internet of Things	2+1 SWS	Lecture / Practice (VÜ)	Beigl
Exams					
SS 2019	7500107	Mobile Computing and Internet of Things		Prüfung (PR)	Beigl
SS 2019	7500107_190926	Mobile Computing and Internet of Things		Prüfung (PR)	Beigl
WS 19/20	7500184	Mobile Computing and Internet of Things		Prüfung (PR)	Beigl

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

V Mobile Computing and Internet of Things

2400051, WS 19/20, 2+1 SWS, Language: German, Open in study portal

Lecture / Practice (VÜ)

Notes
Lecture: Tue: 9:45-11:15. Exercise will be Tue 8:00-9:30. FIRST EXERCISE WILL BE ANNOUNCED. NO EXERCISE on Tue Oct, 17.

Literature
Wird in der Vorlesung bekannt gegeben

T 9.100 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-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	5	Each term	2

Events					
SS 2019	2183703	Modelling and Simulation	2+1 SWS	Lecture / Practice (VÜ)	Nestler
WS 19/20	2183703	Numerical methods and simulation techniques	3 SWS	Lecture / Practice (VÜ)	Nestler
Exams					
SS 2019	76-T-MACH-100300	Modelling and Simulation		Prüfung (PR)	Nestler
WS 19/20	76-T-MACH-100300	Modelling and Simulation		Prüfung (PR)	Nestler

Competence Certificate
Written exam, 90 min

Prerequisites
none

Recommendation
preliminary knowlegde in mathematics, physics and materials science

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

V Modelling and Simulation
2183703, SS 2019, 2+1 SWS, Language: German, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

Slides and black board. The slides will be provided as a manuscript for the course.

Notes
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 knowlegde 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

Learning Content
The course gives an introduction to modelling and simulation techniques.
The following topics are included:
- splines, interpolation methods, Taylor series
- finite difference method
- dynamical systems
- numerics of partial differential equations
- mass and heat diffusion
- microstructure simulation
- parallel and adaptive algorithms
- high performance computing
- practical exercises

Workload
regular attendance: 22,5 hours lecture, 11,5 hours exercises
self-study: 116 hours

Literature

1. Scientific Computing, G. Golub and J.M. Ortega (B.G.Teubner Stuttgart 1996)

V **Numerical methods and simulation techniques** **Lecture / Practice (VÜ)**
2183703, WS 19/20, 3 SWS, Language: German, Open in study portal

Description
Media:

Slides and black board. The slides will be provided as a manuscript for the course.

Notes
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 knowlegde 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

Learning Content
The course gives an introduction to modelling and simulation techniques.

The following topics are included:

- polynom interpolation methods, splines, Taylor series
- zero point algorithms
- regression methods
- numerical differentiation and integration
- finite difference method
- dynamical systems, ordinary partial differential equations
- numerics of partial differential equations
- mass and heat diffusion equation
- computer lab in the programming language C, practical exercises

In parallel to the lecture, regular exercise sheets are provided and discussed. In addition, the course will be accompanied by practical exercises at the computer. Precondition to register for the written exam is the successful participation in the accompanying computer lab by presenting the solved excercise sheets at the PC.

Workload
regular attendance: 22,5 hours lecture, 11,5 hours exercises
self-study: 116 hours

Literature

1. Scientific Computing, G. Golub and J.M. Ortega (B.G.Teubner Stuttgart 1996)

T 9.101 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-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Oral examination	5	Each winter term	2

Events					
WS 19/20	2183702	Modelling of Microstructures	3 SWS	Lecture / Practice (VÜ)	August, Nestler
Exams					
SS 2019	76-T-MACH-105303	Modelling of Microstructures		Prüfung (PR)	August, Nestler, Weygand

Competence Certificate
oral exam 30 min

Prerequisites
none

Recommendation
materials science
fundamental mathematics

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

V Modelling of Microstructures

Lecture / Practice (VÜ)

2183702, WS 19/20, 3 SWS, Language: German, Open in study portal

Description
Media:

Black board and slides.

Notes

- Brief Introduction in thermodynamics
- Statistical interpretation of entropy
- Gibbs free energy and phase diagrams
- Free energy functional
- Phasefield equation
- Gibbs-Thomson-equation
- Driving forces
- Grand chemical potential functional and the evolution equations
- For compare: Free energy functional with driving forces

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.
- describe the specific characteristics of dendritic, eutectic and peritectic microstructures.
- explain the mechanisms of grain and phase boundary motion induced by external fields
- use the phase-field method for simulation of microstructure formation processes using modeling approaches and challenges of current research
- has 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

We regularly hand out exercise sheets. The individual solutions will be corrected.

oral exam ca. 30 min

Learning Content

- Brief Introduction in thermodynamics
- Statistical interpretation of entropy
- Gibbs free energy and phase diagrams
- Free energy functional
- Phasefield equation
- Gibbs-Thomson-equation
- Driving forces
- Grand chemical potential functional and the evolution equations
- For compare: Free energy functional with driving forces

Workload
regular attendance: 22,5 hours lecture, 11,5 hours exercises
self-study: 116 hours

Literature

1. Gottstein, G. (2007) Physikalische Grundlagen der Materialkunde. Springer Verlag Berlin Heidelberg
2. Kurz, W. and Fischer, D. (1998) Fundamentals of Solidification. Trans Tech Publications ltd, Switzerland Germany UK USA
3. Porter, D.A. Eastering, K.E. and Sherif, M.Y. (2009) Phase transformation in metals and alloys (third edition). CRC Press, Taylor & Francis Group, Boca Raton, London, New York
4. Gaskell, D.R., Introduction to the thermodynamics of materials
5. Problem sheets

T 9.102 Course: Motor Vehicle Labor [T-MACH-105222]

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

Part of: M-MACH-102695 - Motor Vehicle Laboratory

Type	Credits	Recurrence	Version
Written examination	4	Each term	3

Events					
SS 2019	2115808	Motor Vehicle Laboratory	2 SWS	Practical course (P)	Frey, Knoch
WS 19/20	2115808	Motor Vehicle Laboratory	2 SWS	Practical course (P)	Frey, Knoch
Exams					
SS 2019	76-T-MACH-105222	Motor Vehicle Labor		Prüfung (PR)	Frey, Unrau

Competence Certificate
Colloquium before each experiment

After completion of the experiments: written examination

Duration: 90 minutes

Auxiliary means: none

Prerequisites
none

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

V Motor Vehicle Laboratory
2115808, SS 2019, 2 SWS, Language: German, Open in study portal

Practical course (P)

Learning 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

Workload
regular attendance: 31,5 hours
self-study: 103,5 hours

Literature
1. Matschinsky, W: Radführungen der Straßenfahrzeuge, Verlag TÜV Rheinland, 1998

2. Reimpell, J.: Fahrwerktechnik: Fahrzeugmechanik, Vogel Verlag, 1992

3. Gnadler, R.: Documents to the Motor Vehicle Laboratory

V **Motor Vehicle Laboratory**
2115808, WS 19/20, 2 SWS, Language: German, Open in study portal

Practical course (P)

Learning 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

Workload

regular attendance: 31,5 hours
self-study: 103,5 hours

Literature

1. Matschinsky, W: Radführungen der Straßenfahrzeuge, Verlag TÜV Rheinland, 1998

2. Reimpell, J.: Fahrwerktechnik: Fahrzeugmechanik, Vogel Verlag, 1992

3. Gnadler, R.: Documents to the Motor Vehicle Laboratory

T 9.103 Course: Nonlinear Model Predictive Control - Theory and Applications [T-INFO-107492]

Responsible: Dr. Timm Faulwasser
Organisation: KIT Department of Informatics
Part of: M-INFO-103705 - Nonlinear Model Predictive Control - Theory and Applications

Type	Credits	Recurrence	Version
Oral examination	5	Each summer term	2

Events					
SS 2019	2400100	Nonlinear Model Predictive Control - Theory and Applications	4 SWS	Lecture / Practice (VÜ)	Faulwasser, Mühlpfordt
Exams					
SS 2019	7500258	Nonlinear Model Predictive Control - Theory and Applications		Prüfung (PR)	Faulwasser

T 9.104 Course: Numerical Methods - Exam [T-MATH-100803]

Responsible: Dr. Peer Kunstmann
Prof. Dr. Michael Plum
Prof. Dr. Wolfgang Reichel

Organisation: KIT Department of Mathematics

Part of: M-MATH-100536 - Numerical Methods

Type	Credits	Recurrence	Version
Written examination	5	Each term	1

Events					
SS 2019	0180300	Numerische Methoden (Elektrotechnik, Meteorologie, Geodäsie, Geoinformatik)	2 SWS	Lecture (V)	Kunstmann
SS 2019	0180400	Übungen zu 0180300	1 SWS	Practice (Ü)	Kunstmann
Exams					
SS 2019	0100056	Numerical Methods - Exam		Prüfung (PR)	Anapolitanos, Plum, Wugalter

T 9.105 Course: Optics and Solid State Electronics [T-ETIT-109444]

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-104067 - Optics and Solid State Electronics

Type	Credits	Recurrence	Expansion	Version
Written examination	8	Each summer term	1 terms	1

Prerequisites

none

T 9.106 Course: Optoelectronic Components [T-ETIT-101907]

Responsible: Prof. Dr. Wolfgang Freude
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100509 - Optoelectronic Components

Type	Credits	Recurrence	Version
Oral examination	4	Each summer term	1

Events					
SS 2019	2309486	Optoelectronic Components	2 SWS	Lecture (V)	Freude
SS 2019	2309487	Optoelectronic Components (Tutorial)	1 SWS	Practice (Ü)	Freude
Exams					
SS 2019	7309486	Optoelectronic Components		Prüfung (PR)	Freude

Prerequisites
none

T 9.107 Course: Optoelectronics [T-ETIT-100767]

Responsible: Prof. Dr. Ulrich Lemmer
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100480 - Optoelectronics

Type	Credits	Recurrence	Version
Oral examination	4	Each summer term	1

Events					
SS 2019	2313726	Optoelectronics	2 SWS	Lecture (V)	Lemmer
SS 2019	2313728	Übungen zu 2313726 Optoelektronik	1 SWS	Practice (Ü)	Lemmer
Exams					
SS 2019	7313726	Optoelectronics		Prüfung (PR)	Lemmer

Prerequisites
none

T 9.108 Course: Organ Support Systems [T-MACH-105228]

Responsible: Prof. Dr. Christian Pylatiuk
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102702 - Organ Support Systems

Type	Credits	Recurrence	Version
Written examination	4	Each summer term	1

Events					
SS 2019	2106008	Organ support systems	2 SWS	Lecture (V)	Pylatiuk
Exams					
SS 2019	76-T-MACH-105228	Organ Support Systems		Prüfung (PR)	Pylatiuk

Competence Certificate
Written examination (Duration: 45min)

Prerequisites
none

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

V Organ support systems
2106008, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Notes
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.

Learning 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.

Workload
General attendance: 21 h

Self-study: 99 h

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 9.109 Course: Passive Components [T-ETIT-100292]

Responsible: Dr. Wolfgang Menesklou
Dr.-Ing. Stefan Wagner
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-102734 - Materials

Type	Credits	Recurrence	Version
Written examination	5	Each winter term	1

Events					
WS 19/20	2304206	Passive Devices	2 SWS	Lecture (V)	Menesklou, Wagner
WS 19/20	2304208	Passive Devices (Tutorial to 2304206)	1 SWS	Practice (Ü)	Menesklou, Wagner
Exams					
SS 2019	7304206	Passive Components		Prüfung (PR)	Menesklou

Modeled Conditions
You have to fulfill one of 2 conditions:

1. The course T-MACH-105535 - Composite Manufacturing - Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies must not have been started.
2. The course T-MACH-100531 - Systematic Materials Selection must not have been started.

9.110 Course: Photovoltaic System Design [T-ETIT-100724]

Responsible: Robin Grab
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100411 - Photovoltaic System Design

Type	Credits	Version
Written examination	3	1

Events					
SS 2019	2307380	Photovoltaische Systemtechnik	2 SWS	Lecture (V)	Grab
Exams					
SS 2019	7307380	Photovoltaics		Prüfung (PR)	Leibfried

Prerequisites
none

T 9.111 Course: Physical Basics of Laser Technology [T-MACH-102102]

Responsible: Dr.-Ing. Johannes Schneider
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Oral examination	5	Each winter term	3

Events					
WS 19/20	2181612	Physical basics of laser technology	3 SWS	Lecture / Practice (VÜ)	Schneider
Exams					
SS 2019	76-T-MACH-102102	Physical Basics of Laser Technology		Prüfung (PR)	Schneider
WS 19/20	76-T-MACH-102102	Physical Basics of Laser Technology		Prüfung (PR)	Schneider

Competence Certificate
oral examination (30 min)

no tools or reference materials

Prerequisites
It is not possible, to combine this brick with brick Laser Application in Automotive Engineering [T-MACH-105164] and brick Physical Basics of Laser Technology [T-MACH-109084]

Recommendation
Basic knowledge of physics, chemistry and material science

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

V Physical basics of laser technology

2181612, WS 19/20, 3 SWS, Language: German, Open in study portal

Lecture / Practice (VÜ)

Description
Media:

lecture notes via ILIAS

Notes
Based on the description of the physical basics about the formation and the properties of laser light the lecture goes through the different types of laser beam sources used in industry these days. The lecture focuses on the usage of lasers especially in materials engineering. Other areas like measurement technology or medical applications are also mentioned. An excursion to the laser laboratory of the Institute for Applied Materials (IAM) will be offered.

- physical basics of laser technology
- laser beam sources (solid state, diode, gas, liquid and other lasers)
- beam properties, guiding and shaping
- lasers in materials processing
- lasers in measurement technology
- lasers for medical applications
- savety aspects

The lecture is complemented by a tutorial.

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.

Learning Content
Based on the description of the physical basics about the formation and the properties of laser light the lecture goes through the different types of laser beam sources used in industry these days. The lecture focuses on the usage of lasers especially in materials engineering. Other areas like measurement technology or medical applications are also mentioned. An excursion to the laser laboratory of the Institute for Applied Materials (IAM) will be offered.

- physical basics of laser technology
- laser beam sources (solid state, diode, gas, liquid and other lasers)
- beam properties, guiding and shaping
- lasers in materials processing
- lasers in measurement technology
- lasers for medical applications
- savety aspects

The lecture is complemented by a tutorial.

Annotation
It is allowed to select only one of the lectures "Laser in automotive engineering" (2182642) or "Physical basics of laser technology" (2181612) during the Bachelor and Master studies.

Workload
regular attendance: 33,5 hours
self-study: 116,5 hours

Literature
W. T. Silfvast: Laser Fundamentals, 2008, Cambridge University Press

W. M. Steen: Laser Material Processing, 2010, Springer

T 9.112 Course: Physics for Engineers [T-MACH-100530]

Responsible: Prof. Dr. Martin Dienwiebel
Prof. Dr. Peter Gumbsch
Prof. Dr. Alexander Nesterov-Müller
Dr. Daniel Weygand

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	5	Each summer term	1

Events					
SS 2019	2142890	Physics for Engineers	2 SWS	Lecture (V)	Weygand, Dienwiebel, Nesterov-Müller, Gumbsch
Exams					
SS 2019	76-T-MACH-100530	Physics for Engineers		Prüfung (PR)	Gumbsch, Weygand, Nesterov-Müller, Dienwiebel

Competence Certificate
written exam 90 min

Prerequisites
none

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

V Physics for Engineers
2142890, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Notes
1) Foundations of solid state physics

- Wave particle dualism
- Tunnelling
- Schrödinger equation
- H-atom

2) Electrical conductivity of solids

- solid state: periodic potentials
- Pauli Principle
- band structure
- metals, semiconductors and isolators
- p-n junction / diode

3) Optics

- quantum mechanical principles of the laser
- linear optics
- non-linear optics

Exercises (2142891, 2 SWS) are used for complementing and deepening the contents of the lecture as well as for answering more extensive questions raised by the students and for testing progress in learning of the topics.

The student

- has the basic understanding of the physical foundations to explain the relationship between the quantum mechanical principles and the optical as well as electrical properties of materials
- can describe the fundamental experiments, which allow the illustration of these principles

regular attendance: 22,5 hours (lecture) and 22,5 hours (excerises 2142891)
self-study: 97,5 hours and 49 hours (excerises 2142891)

The assessment consists of a written exam (90 minutes) (following §4(2), 1 of the examination regulation).

Learning Content
1) Foundations of solid state physics

- Wave particle dualism
- Tunnelling
- Schrödinger equation
- H-atom

2) Electrical conductivity of solids

- solid state: periodic potentials
- Pauli Principle
- band structure
- metals, semiconductors and isolators
- p-n junction / diode

3) Optics

- quantum mechanical principles of the laser
- linear optics
- non-linear optics

Exercises (2142891, 2 SWS) are used for complementing and deepening the contents of the lecture as well as for answering more extensive questions raised by the students and for testing progress in learning of the topics.

Workload
regular attendance: 22,5 hours (lecture) and 22,5 hours (excerises 2142891)
self-study: 97,5 hours and 49 hours (excerises 2142891)

Literature

- Tipler und Mosca: Physik für Wissenschaftler und Ingenieure, Elsevier, 2004
- Haken und Wolf: Atom- und Quantenphysik. Einführung in die experimentellen und theoretischen Grundlagen, 7. Aufl., Springer, 2000
- Harris, Moderne Physik, Pearson Verlag, 2013

T 9.113 Course: Physiology and Anatomy for Engineers I [T-ETIT-101932]

Responsible: Prof. Dr. Olaf Dössel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100390 - Physiology and Anatomy for Engineers I

Type	Credits	Recurrence	Version
Written examination	3	Each winter term	1

Events					
WS 19/20	2305281	Physiology and Anatomy for Engineers I	2 SWS	Lecture (V)	Breustedt
Exams					
SS 2019	7305281	Physiology and Anatomy for Engineers I		Prüfung (PR)	Breustedt

Prerequisites
none

9.114 Course: Power Electronics [T-ETIT-100801]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100533 - Power Electronics

Type	Credits	Recurrence	Version
Written examination	5	Each summer term	2

Events					
SS 2019	2306320	Power Electronics	2 SWS	Lecture (V)	Hiller
SS 2019	2306322	Übungen zu 2306320 Leistungselektronik	1 SWS	Practice (Ü)	Hiller
Exams					
SS 2019	7306320	Power Electronics		Prüfung (PR)	Hiller

9.115 Course: Power Generation [T-ETIT-101924]

Responsible: Dr.-Ing. Bernd Hoferer
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100407 - Power Generation

Type	Credits	Recurrence	Version
Oral examination	3	Each winter term	2

Events					
WS 19/20	2307356	Power Generation	2 SWS	Lecture (V)	Hoferer
Exams					
SS 2019	7307356	Power Generation		Prüfung (PR)	Hoferer

Prerequisites
none

9.116 Course: Power Transmission and Power Network Control [T-ETIT-101941]

Responsible: Prof. Dr.-Ing. Thomas Leibfried
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100534 - Power Transmission and Power Network Control

Type	Credits	Recurrence	Version
Written examination	5	Each summer term	1

Events					
SS 2019	2307372	Power Transmission and Power Network Control	2 SWS	Lecture (V)	Leibfried
SS 2019	2307374	Übungen zu 2307372 Energieübertragung und Netzregelung	1 SWS	Practice (Ü)	Nowak
Exams					
SS 2019	7307372	Power Transmission and Power Network Control		Prüfung (PR)	Leibfried

Prerequisites
none

T 9.117 Course: Practical Aspects of Electrical Drives [T-ETIT-100711]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100394 - Practical Aspects of Electrical Drives

Type	Credits	Recurrence	Version
Written examination	4	Each summer term	1

Events					
SS 2019	2306311	Practical Aspects of Electrical Drives	2 SWS	Lecture (V)	Doppelbauer
SS 2019	2306313	Übungen zu 2306311 Praxis elektrischer Antriebe	1 SWS	Practice (Ü)	Doppelbauer
Exams					
SS 2019	7306311	Practical Aspects of Electrical Drives		Prüfung (PR)	Doppelbauer

Prerequisites
none

T 9.118 Course: Practical Design of Control Systems [T-ETIT-107702]

Responsible: Prof. Dr.-Ing. Sören Hohmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-103814 - Practical Design of Control Systems

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	2

Events					
WS 19/20	2303163	Practical Design of Control Systems	2 SWS	Lecture (V)	Flad
WS 19/20	2303164	Practical Design of Control Systems (Tutorial to 2303163)	1 SWS	Practice (Ü)	Stark
Exams					
SS 2019	7303163	Practical Design of Control Systems		Prüfung (PR)	Flad

Prerequisites
The successful participation in the workshop is a prerequisite for admission to the examination.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-ETIT-108117 - Workshop Practical Design of Control Systems must have been passed.

Annotation
Attention: The successful participation in the workshop is a prerequisite for admission to the examination.

T 9.119 Course: Practical Project Robotics and Automation I (Software) [T-INFO-104545]

Responsible: Prof. Dr.-Ing. Björn Hein
Organisation: KIT Department of Informatics
Part of: M-INFO-102224 - Practical Project Robotics and Automation I (Software)

Type	Credits	Recurrence	Version
Examination of another type	6	Each term	1

Events					
WS 19/20	24282	Robotics and Automation I (Software)	4 SWS	Practical course (P)	Hein, Längle
Exams					
SS 2019	750003	Project practical Robotics and Automation I (Software)		Prüfung (PR)	Kröger, Hein

T 9.120 Course: Practical Project Robotics and Automation II (Hardware) [T-INFO-104552]

Responsible: Prof. Dr.-Ing. Björn Hein
Organisation: KIT Department of Informatics
Part of: M-INFO-102230 - Practical Project Robotics and Automation II (Hardware)

Type	Credits	Recurrence	Version
Examination of another type	6	Each term	1

Events					
WS 19/20	24290	Robotics and Automation II (Hardware)	4 SWS	Practical course (P)	Hein, Längle
Exams					
SS 2019	750004	Practical Course		Prüfung (PR)	Kröger, Hein

T 9.121 Course: Presentation [T-MACH-107760]

Responsible: Prof. Dr.-Ing. Peter Gratzfeld
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-104262 - Bachelor Thesis

Type	Credits	Recurrence	Version
Completed coursework	3	Each term	1

Competence Certificate
The colloquium presentation must be held within the maximum processing time of the modul Bachleor Thesis but latest 6 weeks after the submission of the bachelor thesis.

The presentation should last around 20 minutes followed by a scientific discussion with the present expert audience. The students should show that they are able to independently present and discuss the content of their bachelor thesis according to scientific criteria.

Prerequisites
Bachelor Thesis has been started.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-108800 - Bachelor Thesis must have been started.

T 9.122 Course: Principles of Medicine for Engineers [T-MACH-105235]

Responsible: Prof. Dr. Christian Pylatiuk
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102720 - Principles of Medicine for Engineers

Type	Credits	Recurrence	Version
Written examination	4	Each winter term	1

Events					
WS 19/20	2105992	Principles of Medicine for Engineers	2 SWS	Lecture (V)	Pylatiuk
Exams					
SS 2019	76-T-MACH-105235	Principles of Medicine for Engineers		Prüfung (PR)	Pylatiuk

Competence Certificate
Written examination (Duration: 45min)

Prerequisites
none

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

V Principles of Medicine for Engineers
2105992, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Notes
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.

Learning 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.

Annotation
Recommendations: Organ support systems

Workload
General attendance: 21 h

Self-study: 99 h

Literature

- Adolf Faller, Michael Schünke: Der Körper des Menschen. Thieme Verlag.
- Renate Huch, Klaus D. Jürgens: Mensch Körper Krankheit. Elsevier Verlag.

T 9.123 Course: Product Lifecycle Management [T-MACH-105147]

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

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	4	Each winter term	2

Events					
WS 19/20	2121350	Product Lifecycle Management	2 SWS	Lecture (V)	Ovtcharova
Exams					
SS 2019	76-T-MACH-105147	Product Lifecycle Management		Prüfung (PR)	Ovtcharova

Competence Certificate
Writen examination 90 min.

Prerequisites
None

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

V Product Lifecycle Management
2121350, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content
Product Lifecycle Management (PLM) is an approach to the holistic and cross-company management and control of all product-related processes and data throughout the life cycle along the extended supply chain - from design and production to sales, to the dismantling and recycling.

Product Lifecycle Management is a comprehensive approach for effective and efficient design of the product life cycle. Based on all product information, which comes up across the entire value chain and across multiple partners, processes, methods and tools are made available to provide the right information at the right time, quality and the right place.

The course covers:

- A consistent description of all business processes that occur during the product life cycle (development, production, sales, dismantling, ...)
- the presentation of methods for the performance of the PLM business processes,
- explaining the most important corporate information systems to support the life cycle (PDM, ERP, SCM, CRM systems) to sample the software manufacturer SAP

Workload
regular attendance: 42 hours
self-study: 128 hours

Literature
Lecture slides.

V. Arnold et al: Product Lifecycle Management beherrschen, Springer-Verlag, Heidelberg, 2005.

J. Stark: Product Lifecycle Management, 21st Century Paradigm for Product Realisation, Springer-Verlag, London, 2006.

A. W. Scheer et al: Prozessorientiertes Product Lifecycle Management, Springer-Verlag, Berlin, 2006.

J. Schöttner: Produktdatenmanagement in der Fertigungsindustrie, Hanser-Verlag, München, 1999.

M.Eigner, R. Stelzer: Produktdaten Management-Systeme, Springer-Verlag, Berlin, 2001.

G. Hartmann: Product Lifecycle Management with SAP, Galileo press, 2007.

K. Obermann: CAD/CAM/PLM-Handbuch, 2004.

T 9.124 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-102711 - Production Techniques Laboratory

Type	Credits	Recurrence	Version
Completed coursework	4	Each summer term	3

Events					
SS 2019	2110678	Production Techniques Laboratory	4 SWS	Practical course (P)	Deml, Fleischer, Furmans, Ovtcharova
Exams					
SS 2019	76-T-MACH-105346	Production Techniques Laboratory		Prüfung (PR)	Deml, Furmans, Ovtcharova, Schulze

Competence Certificate

Advanced Internship: Participate in practicle exercise courses and complete the colloquia successfully.

Elective Subject: Participate in practicle exercise courses and complete the colloquia successfully and presentation of a specific topic.

Prerequisites

None

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

V Production Techniques Laboratory

Practical course (P)

2110678, SS 2019, 4 SWS, Language: German, Open in study portal

Description

Media:

several

Notes
The production technique laboratory (PTL) is a collaboration of the institutes wbk, IFL, IMI and ifab.

1. Computer Aided Product Development (IMI)
2. Computer communication in factory (IMI)
3. Production of parts with CNC turning machines (wbk)
4. Controlling of production systems using PLCs (wbk)
5. Automated assembly systems (wbk)
6. Optical identification in production and logistics (IFL)
7. RFID identification systems (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.

Learning Content
The production technique laboratory (PTL) is a collaboration of the institutes wbk, IFL, IMI and ifab.

1. Computer Aided Product Development (IMI)
2. Computer communication in factory (IMI)
3. Production of parts with CNC turning machines (wbk)
4. Controlling of production systems using PLCs (wbk)
5. Automated assembly systems (wbk)
6. Optical identification in production and logistics (IFL)
7. RFID identification systems (IFL)
8. Storage and order-picking systems (IFL)
9. Production Management (ifab)
10. Time study (ifab)
11. Accomplishment of workplace design (ifab)

Annotation
none

Workload
The amount of work is 120 h (=4 ECTS).

Literature
Handouts and literature references are available online on ILIAS.

T 9.125 Course: Programming [T-INFO-101531]

Responsible: Prof. Dr.-Ing. Anne Koziolek
Prof. Dr. Ralf Reussner

Organisation: KIT Department of Informatics

Part of: M-INFO-101174 - Programming

Type	Credits	Recurrence	Version
Examination of another type	6	Each winter term	1

Events					
WS 19/20	24004	Programming	4 SWS	Lecture / Practice (VÜ)	Koziolek
Exams					
SS 2019	7500195	Programming		Prüfung (PR)	Reussner
WS 19/20	7500075	Programming		Prüfung (PR)	Reussner

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-INFO-101967 - Programming Pass must have been passed.

T 9.126 Course: Programming Pass [T-INFO-101967]

Responsible: Prof. Dr.-Ing. Anne Koziolek
Prof. Dr. Ralf Reussner

Organisation: KIT Department of Informatics

Part of: M-INFO-101174 - Programming

Type	Credits	Recurrence	Version
Completed coursework	0	Each term	1

Events					
WS 19/20	24004	Programming	4 SWS	Lecture / Practice (VÜ)	Koziolek
Exams					
SS 2019	7500022	Programming Pass		Prüfung (PR)	Reussner
WS 19/20	7500074	Programming Pass		Prüfung (PR)	Reussner

T 9.127 Course: Project Management in the Development of Products for Safety-Critical Applications [T-ETIT-109148]

Responsible: Dr.-Ing. Manfred Nolle
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104475 - Project Management in the Development of Products for Safety-Critical Applications

Type	Credits	Recurrence	Version
Oral examination	4	Each term	2

Events					
WS 19/20	2311641	Project Management in the Development of Products for Safety-Critical Applications	2 SWS		Nolle

T 9.128 Course: Radiation Protection [T-ETIT-100825]

Responsible: Prof. Dr. Olaf Dössel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100562 - Radiation Protection

Type	Credits	Recurrence	Version
Oral examination	3	Each summer term	1

Events					
SS 2019	2305272	Radiation Protection	2 SWS	Lecture (V)	Breustedt
Exams					
SS 2019	7305272	Radiation Protection		Prüfung (PR)	Breustedt

Prerequisites
none

T 9.129 Course: Rail Vehicle Technology [T-MACH-105353]

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

Part of: M-MACH-102683 - Rail Vehicle Technology

Type	Credits	Recurrence	Version
Oral examination	4	Each term	1

Events					
SS 2019	2115996	Rail Vehicle Technology	2 SWS	Lecture (V)	Gratzfeld
WS 19/20	2115996	Rail Vehicle Technology	2 SWS	Lecture (V)	Gratzfeld
Exams					
SS 2019	76-T-MACH-105353	Rail Vehicle Technology		Prüfung (PR)	Gratzfeld
SS 2019	76-T-MACH-105355	Rail Vehicle Technology		Prüfung (PR)	Gratzfeld
WS 19/20	76-T-MACH-105353	Rail Vehicle Technology		Prüfung (PR)	Gratzfeld

Competence Certificate
Oral examination

Duration: ca. 20 minutes

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

Prerequisites
none

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

V Rail Vehicle Technology
2115996, SS 2019, 2 SWS, Language: German, Open in study portal

Lecture (V)

Description
Media:

All slides are available for download (Ilias-platform).

Notes

1. Vehicle system technology: structure and main systems of rail vehicles
2. Car body: functions, requirements, design principles, crash elements, interfaces
3. Bogies: forces, running gears, axle configuration
4. Drives: vehicle with/without contact wire, dual-mode vehicle
5. Brakes: tasks, basics, principles, blending, brake control
6. Train control management system: definitions, networks, bus systems, components, examples
7. Vehicle concepts: trams, metros, regional trains, intercity trains, high speed trains, double deck coaches, locomotives, freight wagons

Learning Content

1. Vehicle system technology: structure and main systems of rail vehicles
2. Car body: functions, requirements, design principles, crash elements, interfaces
3. Bogies: forces, running gears, axle configuration
4. Drives: vehicle with/without contact wire, dual-mode vehicle
5. Brakes: tasks, basics, principles, blending, brake control
6. Train control management system: definitions, networks, bus systems, components, examples
7. Vehicle concepts: trams, metros, regional trains, intercity trains, high speed trains, double deck coaches, locomotives, freight wagons

Workload
Regular attendance: 21 hours

Self-study: 21 hours

Exam and preparation: 78 hours

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

V	**Rail Vehicle Technology** 2115996, WS 19/20, 2 SWS, Language: German, Open in study portal	**Lecture (V)**

Notes

1. Vehicle system technology: structure and main systems of rail vehicles
2. Car body: functions, requirements, design principles, crash elements, interfaces
3. Bogies: forces, running gears, axle configuration
4. Drives: vehicle with/without contact wire, dual-mode vehicle
5. Brakes: tasks, basics, principles, blending, brake control
6. Train control management system: definitions, networks, bus systems, components, examples
7. Vehicle concepts: trams, metros, regional trains, intercity trains, high speed trains, double deck coaches, locomotives, freight wagons

Learning Content

1. Vehicle system technology: structure and main systems of rail vehicles
2. Car body: functions, requirements, design principles, crash elements, interfaces
3. Bogies: forces, running gears, axle configuration
4. Drives: vehicle with/without contact wire, dual-mode vehicle
5. Brakes: tasks, basics, principles, blending, brake control
6. Train control management system: definitions, networks, bus systems, components, examples
7. Vehicle concepts: trams, metros, regional trains, intercity trains, high speed trains, double deck coaches, locomotives, freight wagons

Workload
Regular attendance: 21 hours

Self-study: 21 hours

Exam and preparation: 78 hours

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

T 9.130 Course: Real-Time Systems [T-INFO-101340]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Prof. Dr.-Ing. Thomas Längle
Organisation: KIT Department of Informatics
Part of: M-INFO-100803 - Real-Time Systems

Type	Credits	Recurrence	Version
Written examination	6	Each summer term	1

Events					
SS 2019	24576	Real-Time Systems	4 SWS	Lecture / Practice (VÜ)	Längle, Ledermann
Exams					
SS 2019	750002	Real-Time Systems		Prüfung (PR)	Längle

T 9.131 Course: Robotics - Practical Course [T-INFO-105107]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Organisation: KIT Department of Informatics
Part of: M-INFO-102522 - Robotics - Practical Course

Type	Credits	Recurrence	Version
Examination of another type	6	Each summer term	2

Events					
SS 2019	24870	Robotics - Practical Course	4 SWS	Practical course (P)	Asfour, Beil, Patzer, Grotz
Exams					
SS 2019	7500261	Robotics - Practical Course		Prüfung (PR)	Asfour

Recommendation
Should have attended the lectures Robotics I - III, and Mechano-Informatics and Robotics.

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

V Robotics - Practical Course

24870, SS 2019, 4 SWS, Language: German, Open in study portal

Practical course (P)

Learning Content
The student knows concrete solutions for different problems in robotics. He/she uses methods of inverse kinematics, grasp and motion planning, and visual perception. The student can implement solutions in the programming language C++ with the help of suitable software frameworks.

Workload
180 h

T 9.132 Course: Robotics I - Introduction to Robotics [T-INFO-108014]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Organisation: KIT Department of Informatics
Part of: M-INFO-100893 - Robotics I - Introduction to Robotics

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	1

Events					
WS 19/20	2424152	Robotics I - Introduction to Robotics	3/1 SWS	Lecture (V)	Asfour
Exams					
SS 2019	7500218	Robotik I - Einführung in die Robotik		Prüfung (PR)	Asfour
WS 19/20	7500106	Robotics I - Introduction to Robotics		Prüfung (PR)	Asfour

T 9.133 Course: Robotics II: Humanoid Robotics [T-INFO-105723]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Organisation: KIT Department of Informatics
Part of: M-INFO-102756 - Robotics II: Humanoid Robotics

Type	Credits	Recurrence	Version
Written examination	3	Each summer term	3

Events					
SS 2019	2400074	Robotics II: Humanoid Robotics	2 SWS	Lecture (V)	Asfour, Wächter
Exams					
SS 2019	7500086	Robotics II: Humanoid Robotics		Prüfung (PR)	Asfour
WS 19/20	7500211	Robotics II: Humanoid Robotics		Prüfung (PR)	Asfour

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

V Robotics II: Humanoid Robotics

2400074, SS 2019, 2 SWS, Language: German/English, Open in study portal

Lecture (V)

Learning Content
The lecture presents current work in the field of humanoid robotics that deals with the implementation of complex sensorimotor and cognitive abilities. In the individual topics different methods and algorithms, their advantages and disadvantages, as well as the current state of research are discussed.

The topics addressed are: biomechanical models of the human body, biologically inspired and data-driven methods of grasping, active perception, imitation learning and programming by demonstration as well as semantic representations of sensorimotor experience

Workload
90 h

T 9.134 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-INFO-104897 - Robotics III - Sensors and Perception in Robotics

Type	Credits	Recurrence	Version
Written examination	3	Each summer term	2

Events					
SS 2019	2400067	Robotics III - Sensors and Perception in Robotics	2 SWS	Lecture (V)	Asfour, Grotz
Exams					
SS 2019	7500242	Robotics III - Sensors and Perception in Robotics		Prüfung (PR)	Asfour

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

V Robotics III - Sensors and Perception in Robotics

2400067, SS 2019, 2 SWS, Language: German/English, Open in study portal

Lecture (V)

Learning Content

The lecture supplements the lecture Robotics I with a broad overview of sensors used in robotics. The lecture focuses on visual perception, object recognition, simultaneous localization and mapping (SLAM) and semantic scene interpretation. The lecture is divided into two parts:

In the first part a comprehensive overview of current sensor technologies is given. A basic 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 concentrates on the use of exteroceptive sensors in robotics. The topics covered include tactile exploration and visual data processing, including advanced topics such as feature extraction, object localization, simultaneous localization and mapping (SLAM) and semantic scene interpretation.

Workload

90h

T 9.135 Course: Scientific Computing for Engineers [T-MACH-100532]

Responsible: Prof. Dr. Peter Gumbsch
Dr. Daniel Weygand

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	5	Each winter term	2

Events					
WS 19/20	2181738	Scientific computing for Engineers	2 SWS	Lecture (V)	Weygand, Gumbsch
WS 19/20	2181739	Exercises for Scientific Computing for Engineers	2 SWS	Practice (Ü)	Weygand
Exams					
SS 2019	76-T-MACH-100532	Scientific Computing for Engineers		Prüfung (PR)	Weygand, Gumbsch

Competence Certificate
Written exam (90 minutes)

Prerequisites
The brick can not be combined with the brick "Application of advanced programming languages in mechanical engineering" (T-MACH-105390).

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

V Scientific computing for Engineers
2181738, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Notes
1. Introduction: why scientific computing
2. computer architectures
3. Introduction to Unix/Linux
4. Foundations of C++
* progamm organization
* data types, operator, control structures
* dynamic memory allocation
* functions
* class
* OpenMP parallelization
5. numeric /algorithms
* finite differences
* MD simulations: 2nd order differential equations
* algorithms for particle simulations
* solver for linear systems of eqns.

The student can

- apply the programming language C++ for scientific computing in the field of materials science
- adapt programs for use on parallel platforms
- choose suitable numerical methods for the solution of differential equations.

The lecture can not be combined with the lecture "Application of advanced programming languages in mechanical engineering" (2182735).

regular attendance: 22,5 hours
Lab: 22,5 hours (optional)
self-study: 75 hours

written exam 90 minutes

Learning Content
1. Introduction: why scientific computing
2. computer architectures
3. Introduction to Unix/Linux
4. Foundations of C++
* progamm organization
* data types, operator, control structures
* dynamic memory allocation
* functions
* class
* OpenMP parallelization
5. numeric /algorithms
* finite differences
* MD simulations: 2nd order differential equations
* algorithms for particle simulations
* solver for linear systems of eqns.

Annotation
The lecture can not be combined with the lecture "Application of advanced programming languages in mechanical engineering" (2182735).

Workload
regular attendance: 22,5 hours
Lab: 22,5 hours (optional)
self-study: 75 hours

Literature

1. C++: Einführung und professionelle Programmierung; U. Breymann, Hanser Verlag München
2. C++ and object-oriented numeric computing for Scientists and Engineers, Daoqui Yang, Springer Verlag.
3. The C++ Programming Language, Bjarne Stroustrup, Addison-Wesley
4. Die C++ Standardbibliothek, S. Kuhlins und M. Schader, Springer Verlag

Numerik:

1. Numerical recipes in C++ / C / Fortran (90), Cambridge University Press
2. Numerische Mathematik, H.R. Schwarz, Teubner Stuttgart
3. Numerische Simulation in der Moleküldynamik, Griebel, Knapek, Zumbusch, Caglar, Springer Verlag

V

Exercises for Scientific Computing for Engineers

2181739, WS 19/20, 2 SWS, Language: German, Open in study portal

Practice (Ü)

Notes
Exercises for the different topics of the lecture "Scientific computing for Engineers" (2181738)

Learning Content
Exercises for the different topics of the lecture "Scientific computing for Engineers" (2181738)

Workload
regular attendance: 22,5 hours

Literature
lecture notes "Scientific computing for Engineers" (2181738)

T 9.136 Course: Seminar Battery [T-ETIT-106051]

Responsible: Dr.-Ing. Andre Weber
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-103037 - Seminar Battery

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

Events					
SS 2019	2304226	Seminar Batterien	2 SWS	Seminar (S)	Weber
WS 19/20	2304226	Seminar Battery	2 SWS	Seminar (S)	Weber
Exams					
SS 2019	7304226	Seminar Battery		Prüfung (PR)	Weber

Prerequisites
Participation is allowed in one out of these four modules only:

- M-ETIT-100522 - Seminar Battery Research
- M-ETIT-101852 - Seminar Battery Research I
- M-ETIT-101862 - Seminar Battery Research II
- M-ETIT-103037 - Seminar Battery

T 9.137 Course: Seminar on Selected Chapters of Biomedical Engineering [T-ETIT-100710]

Responsible: Dr.-Ing. Axel Loewe
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100383 - Seminar on Selected Chapters of Biomedical Engineering

Type	Credits	Recurrence	Version
Examination of another type	3	Each winter term	1

Events					
WS 19/20	2305254	Seminar on Selected Chapters of Biomedical Engineering	2 SWS	Seminar (S)	Loewe
Exams					
WS 19/20	7305254	Seminar on Selected Chapters of Biomedical Engineering		Prüfung (PR)	Loewe

Prerequisites
none

T 9.138 Course: Seminar Power Electronics in Regenerative Energy Systems [T-ETIT-100714]

Responsible: Dr.-Ing. Klaus-Peter Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100397 - Seminar Power Electronics in Regenerative Energy Systems

Type	Credits	Recurrence	Version
Examination of another type	4	Each summer term	1

Events					
SS 2019	2306318	Seminar Power Electronics in Regenerative Energy Systems	3 SWS	Seminar (S)	Braun
Exams					
SS 2019	7306318	Seminar Power Electronics in Regenerative Energy Systems		Prüfung (PR)	Braun

Prerequisites
none

T 9.139 Course: Sensors [T-ETIT-101911]

Responsible: Dr. Wolfgang Menesklou
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100378 - Sensors

Type	Credits	Recurrence	Version
Written examination	3	Each winter term	1

Events					
WS 19/20	2304231	Sensors	2 SWS	Lecture (V)	Menesklou
Exams					
SS 2019	7304231	Sensors		Prüfung (PR)	Menesklou

T 9.140 Course: Signals and Systems [T-ETIT-109313]

Responsible: Prof. Dr.-Ing. Fernando Puente León
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104525 - Signals and Systems

Type	Credits	Recurrence	Expansion	Version
Written examination	6	Each winter term	1 terms	1

Events					
WS 19/20	2302109	Signals and Systems	2 SWS	Lecture (V)	Puente León

Prerequisites
none

T 9.141 Course: Signals and Systems - Workshop [T-ETIT-109314]

Responsible: Prof. Dr.-Ing. Fernando Puente León
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-104525 - Signals and Systems

Type	Credits	Recurrence	Expansion	Version
Completed coursework (written)	1	Each winter term	1 terms	1

Prerequisites
none

T 9.142 Course: Software Engineering I [T-INFO-101968]

Responsible: Prof. Dr.-Ing. Anne Koziolek
Prof. Dr. Ralf Reussner
Prof. Dr. Walter Tichy
Organisation: KIT Department of Informatics
Part of: M-INFO-101175 - Software Engineering I

Type	Credits	Recurrence	Version
Written examination	6	Each summer term	1

Events					
SS 2019	24518	Softwaretechnik I	4 SWS	Lecture / Practice (VÜ)	Tichy, Weigelt, Hey
Exams					
SS 2019	7500152	Software Engineering I		Prüfung (PR)	Tichy
SS 2019	7500153	Software Engineering I		Prüfung (PR)	Tichy

T 9.143 Course: Software Engineering I Pass [T-INFO-101995]

Responsible: Prof. Dr. Walter Tichy
Organisation: KIT Department of Informatics
Part of: M-INFO-101175 - Software Engineering I

Type	Credits	Recurrence	Version
Completed coursework	0	Each summer term	1

Events					
SS 2019	24518	Softwaretechnik I	4 SWS	Lecture / Practice (VÜ)	Tichy, Weigelt, Hey
Exams					
SS 2019	7500250	Software Engineering I Pass		Prüfung (PR)	Tichy

T 9.144 Course: Software Engineering II [T-INFO-101370]

Responsible: Prof. Dr.-Ing. Anne Koziolek
Prof. Dr. Ralf Reussner
Prof. Dr. Walter Tichy

Organisation: KIT Department of Informatics

Part of: M-INFO-100833 - Software Engineering II

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	1

Events					
WS 19/20	24076	Software Engineering II	4 SWS	Lecture (V)	Reussner

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

V Software Engineering II

24076, WS 19/20, 4 SWS, Language: German, Open in study portal

Lecture (V)

Description

Students learn methods and techniques for systematic software development. Advanced topics of software engineering are covered.

Literature

Craig Larman, Applying UML and Patterns, 3rd edition, Prentice Hall, 2004. More references will be provided in the lectures.

T 9.145 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-ETIT-102181 - System Dynamics and Control Engineering

Type	Credits	Recurrence	Version
Written examination	6	Each summer term	1

Events					
SS 2019	2303155	Systemdynamik und Regelungstechnik	3 SWS	Lecture (V)	Hohmann
SS 2019	2303157	Übungen zu 2303155 Systemdynamik und Regelungstechnik	1 SWS	Practice (Ü)	Kölsch
SS 2019	2303701	Tutorien zu 2303155 SRT	SWS	Tutorial (Tu)	Kölsch
Exams					
SS 2019	7303155	System Dynamics and Control Engineering		Prüfung (PR)	Hohmann

Prerequisites
none

T 9.146 Course: Systematic Materials Selection [T-MACH-100531]

Responsible: Dr.-Ing. Stefan Dietrich
Organisation: KIT Department of Mechanical Engineering

Part of: M-ETIT-102734 - Materials
M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	5	Each summer term	3

Events					
SS 2019	2174576	Systematic Materials Selection	3 SWS	Lecture (V)	Dietrich
SS 2019	2174577	Übungen zu 'Systematische Werkstoffauswahl'	1 SWS	Practice (Ü)	Dietrich, Mitarbeiter
Exams					
SS 2019	76-T-MACH-100531	Systematic Materials Selection		Prüfung (PR)	Dietrich
WS 19/20	76-T-MACH-100531	Systematic Materials Selection		Prüfung (PR)	Dietrich

Competence Certificate
The assessment is carried out as a written exam of 2 h.

Prerequisites
none

Recommendation
Basic knowledge in materials science, mechanics and mechanical design due to the lecture Materials Science I/II.

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

V Systematic Materials Selection
2174576, SS 2019, 3 SWS, Language: German, Open in study portal

Lecture (V)

Notes
Important aspects and criteria of materials selection are examined and guidelines for a systematic approach to materials selection are deeloped. The following topics are covered:

- Information and introduction
- Necessary basics of materials
- Selected methods / approaches of the material selection
- Examples for material indices and materials property charts
- Trade-off and shape factors
- Sandwich materials and composite materials
- High temperature alloys
- Regard of process influences
- Material selection for production lines
- Incorrect material selection and the resulting consequences
- Abstract and possibility to ask questions

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, bimaterials, foams) and can determine whether following such a concept yields a useful benefit.
requirements:

WiIng SPO 2007 (B.Sc.)

The course Material Science I [21760] has to be completed beforehand.

WiIng (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).

Learning Content
Important aspects and criteria of materials selection are examined and guidelines for a systematic approach to materials selection are deeloped. The following topics are covered:

- Information and introduction
- Necessary basics of materials
- Selected methods / approaches of the material selection
- Examples for material indices and materials property charts
- Trade-off and shape factors
- Sandwich materials and composite materials
- High temperature alloys
- Regard of process influences
- Material selection for production lines
- Incorrect material selection and the resulting consequences
- Abstract and possibility to ask questions

Workload
The workload for the lecture is 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
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 9.147 Course: Technical Thermodynamics and Heat Transfer I [T-MACH-104747]

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

Part of: M-MACH-102386 - Technical Thermodynamics and Heat Transfer I

Type	Credits	Recurrence	Version
Written examination	8	Each winter term	2

Events					
WS 19/20	2165501	Technical Thermodynamics and Heat Transfer I	4 SWS	Lecture (V)	Maas
WS 19/20	3165014	Technical Thermodynamics and Heat Transfer I	4 SWS	Lecture (V)	Schießl, Maas
Exams					
SS 2019	76-T-MACH-104747	Technical Thermodynamics and Heat Transfer I		Prüfung (PR)	Maas
SS 2019	76-T-MACH-104747-englisch	Technical Thermodynamics and Heat Transfer I		Prüfung (PR)	Maas

Competence Certificate
Written exam [duration: 180 min]

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

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-105204 - Excercises in Technical Thermodynamics and Heat Transfer I must have been passed.

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

V Technical Thermodynamics and Heat Transfer I

2165501, WS 19/20, 4 SWS, Language: German, Open in study portal

Lecture (V)

Description
Media:

Blackboard and Powerpoint presentation

Learning Content
System, properties of state
Absolute temperature, model systems
1st law of thermodynamics for resting and moving systems
Entropy and 2nd law of thermodynamics
Behavior of real substances described by tables, diagrams and equations of state
Machine processes

Workload
Regular attendance: 56.3 h

Self-study: 183.8 h

Literature

Lecture notes

Elsner, N.; Dittmann, A.: Energielehre und Stoffverhalten (Grundlagen der technischen Thermodynamik Bd. 1 und 2), 8. Aufl., Akademie-Verlag, 680 S. 1993.

Baehr, H.D.: Thermodynamik: eine Einführung in die Grundlagen und ihre technischen Anwendungen, 9. Aufl., Springer-Verlag, 460 S., 1996.

T 9.148 Course: Technical Thermodynamics and Heat Transfer II [T-MACH-105287]

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

Part of: M-MACH-102830 - Technical Thermodynamics and Heat Transfer II

Type	Credits	Recurrence	Version
Written examination	7	Each summer term	1

Events					
SS 2019	2166526	Technical Thermodynamics and Heat Transfer II	3 SWS	Lecture (V)	Maas
SS 2019	3166526	Technical Thermodynamics and Heat Transfer II	3 SWS	Lecture (V)	Schießl
Exams					
SS 2019	76-T-MACH-105287	Technical Thermodynamics and Heat Transfer II		Prüfung (PR)	Maas
SS 2019	76-T-MACH-105287-englisch	Technical Thermodynamics and Heat Transfer II		Prüfung (PR)	Maas

Competence Certificate
Written exam [duration: 180 min]

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

Modeled Conditions
The following conditions have to be fulfilled:

1. The course **T-MACH-105288 - Excercises in Technical Thermodynamics and Heat Transfer II** must have been passed.

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

V Technical Thermodynamics and Heat Transfer II

2166526, SS 2019, 3 SWS, Language: German, Open in study portal

Lecture (V)

Description
Media:

Blackboard and Powerpoint presentation

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

Workload
Regular attendance: 52,5 hours

Self-study: 142,5 hours

Literature
Course notes

Elsner, N.; Dittmann, A.: Energielehre und Stoffverhalten (Grundlagen der technischen Thermodynamik Bd. 1 und 2), 8. Aufl., Akademie-Verlag, 680 S. 1993.

Baehr, H.D.: Thermodynamik: eine Einführung in die Grundlagen und ihre technischen Anwendungen, 9. Aufl., Springer-Verlag, 460 S., 1996.

T 9.149 Course: Theory of Probability [T-ETIT-101952]

Responsible: Dr.-Ing. Holger Jäkel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-102104 - Theory of Probability

Type	Credits	Recurrence	Version
Written examination	5	Each winter term	1

Events					
WS 19/20	2310505	Theory of Probability	2 SWS	Lecture (V)	Jäkel
WS 19/20	2310507	Tutorial for 2310505 Theory of Probability	1 SWS	Practice (Ü)	Müller
Exams					
SS 2019	7310505	Theory of Probability		Prüfung (PR)	Jäkel

Prerequisites
none

T 9.150 Course: Tutorial Advanced Mathematics I [T-MATH-100525]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-102859 - Advanced Mathematics

Type	Credits	Recurrence	Version
Completed coursework (written)	0	Each winter term	2

Events					
WS 19/20	0131100	Übungen zu 0131000	2 SWS	Practice (Ü)	Arens
WS 19/20	0131300	Übungen zu 0131200	2 SWS	Practice (Ü)	Arens

Competence Certificate
Learning assessment is carried out by written assigments (pre-requesite). Exact requirements will be communicated in the lectures.

Prerequisites
None.

T 9.151 Course: Tutorial Advanced Mathematics II [T-MATH-100526]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-102859 - Advanced Mathematics

Type	Credits	Recurrence	Version
Completed coursework (written)	0	Each summer term	2

Events					
SS 2019	0180900	Übungen zu 0180800	2 SWS	Practice (Ü)	Hettlich
SS 2019	0181100	Übungen zu 0181000	2 SWS	Practice (Ü)	Hettlich
Exams					
SS 2019	7700024	Problem Class for Advanced Mathematics II		Prüfung (PR)	Hettlich, Kirsch, Arens

Competence Certificate
Learning assessment is carried out by written assigments (pre-requesite). Exact requirements will be communicated in the lectures.

Prerequisites
None.

T 9.152 Course: Tutorial Advanced Mathematics III [T-MATH-100527]

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

Organisation: KIT Department of Mathematics

Part of: M-MATH-102859 - Advanced Mathematics

Type	Credits	Recurrence	Version
Completed coursework (written)	0	Each winter term	2

Events					
WS 19/20	0131500	Übungen zu 0131400	2 SWS	Practice (Ü)	Griesmaier
Exams					
SS 2019	7700066	Tutorial Advanced Mathematics III		Prüfung (PR)	Arens, Hettlich

Competence Certificate
Learning assessment is carried out by written assigments (pre-requesite). Exact requirements will be communicated in the lectures.

Prerequisites
None.

T 9.153 Course: Tutorial Engineering Mechanics I [T-MACH-100528]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102402 - Engineering Mechanics

Type	Credits	Recurrence	Version
Completed coursework	0	Each winter term	2

Events					
WS 19/20	2161246	Tutorial Engineering Mechanics I	2 SWS	Practice (Ü)	Lang, Gajek, Böhlke
WS 19/20	3161011	Engineering Mechanics I (Tutorial)	2 SWS	Practice (Ü)	Pallicity, Langhoff

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

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

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

Prerequisites
None

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

V Tutorial Engineering Mechanics I

Practice (Ü)

2161246, WS 19/20, 2 SWS, Language: German, Open in study portal

Notes
Please refer to the lecture Engineering Mechanics I.

Learning Content
see lecture Engineering Mechanics I

Workload
time of attendance: 21h; self-study: 49h

Literature
see lecture Engineering Mechanics I

T 9.154 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-102402 - Engineering Mechanics

Type	Credits	Recurrence	Version
Completed coursework (written)	0	Each summer term	2

Events					
SS 2019	2162251	Tutorial Engineering Mechanics II	2 SWS	Practice (Ü)	N.N., Schneider
SS 2019	3162011	Engineering Mechanics II (Tutorial)	2 SWS	Practice (Ü)	N.N., Langhoff
Exams					
SS 2019	76-T-MACH-100284	Tutorial Engineering Mechanics II		Prüfung (PR)	Böhlke, Langhoff
SS 2019	76-T-MACH-100284-englisch	Tutorial Engineering Mechanics II		Prüfung (PR)	Böhlke, Langhoff

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

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

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

Prerequisites
None

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

V Tutorial Engineering Mechanics II

2162251, SS 2019, 2 SWS, Language: German, Open in study portal

Practice (Ü)

Learning Content
see lecture Engineering Mechanics II

Workload
time of attendance: 21h; self-study: 49h

Literature
see lecture Engineering Mechanics II

T 9.155 Course: Tutorial Engineering Mechanics III [T-MACH-105202]

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

Part of: M-MACH-102402 - Engineering Mechanics

Type	Credits	Recurrence	Version
Completed coursework (written)	0	Each winter term	2

Events					
WS 19/20	2161204	Engineering Mechanics III (Tutorial)	2 SWS	Practice (Ü)	Seemann, Keller, N.N.
WS 19/20	3161013	Engineering Mechanics III (Tutorial)	2 SWS	Practice (Ü)	Seemann, Keller
Exams					
SS 2019	76-T-MACH-105202	Tutorial Engineering Mechanics III		Prüfung (PR)	Seemann

Competence Certificate
Attestations, succesful accomplishment of exercise sheets

Prerequisites
None

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

V Engineering Mechanics III (Tutorial) — Practice (Ü)
2161204, WS 19/20, 2 SWS, Language: German, Open in study portal

Learning Content
In the Tutorial excercises for the corresponding subjects of the lecture are presented. During the tutorial part of the tutorial excercises are presented and instructions for those excercises are given which have to be done as homework.

The homework is mandatory and is corrected by the tutors. A successful elaboration of the homework is necessary to take part in the final exam.

Workload
time of attendance: 21h; self-study: 39h

Literature
Hibbeler: Technische Mechanik 3, Dynamik, München, 2006

Gross, Hauger, Schnell: Technische Mechanik Bd. 3, Heidelberg, 1983

Lehmann: Elemente der Mechanik III, Kinetik, Braunschweig, 1975

Göldner, Holzweissig: Leitfaden der Technischen Mechanik.

Hagedorn: Technische Mechanik III.

T 9.156 Course: Tutorial Mathematical Methods in Continuum Mechanics [T-MACH-110376]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-103205 - Engineering Mechanics

Type	Credits	Recurrence	Expansion	Version
Completed coursework	0	Each winter term	1 terms	1

Events					
WS 19/20	2161255	Tutorial Mathematical Methods in Confinuum Mechanics	2 SWS	Practice (Ü)	Wicht, Böhlke
Exams					
WS 19/20	76-T-MACH-110376	Tutorial Mathematical Methods in Continuum Mechanics		Prüfung (PR)	Böhlke

Competence Certificate
successfully solving the homework sheets. Details are announced in the first lecture.

Prerequisites
None

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

V Tutorial Mathematical Methods in Confinuum Mechanics
Practice (Ü)
2161255, WS 19/20, 2 SWS, Language: German, Open in study portal

Notes
See "Mathematical Methods in Continuum Mechanics"

T 9.157 Course: Vibration Theory [T-MACH-105290]

Responsible: Prof. Dr.-Ing. Alexander Fidlin
Prof. Dr.-Ing. Wolfgang Seemann

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Written examination	5	Each winter term	2

Events					
WS 19/20	2161212	Vibration Theory	2 SWS	Lecture (V)	Fidlin, Römer
WS 19/20	2161213	Übungen zu Technische Schwingungslehre	2 SWS	Practice (Ü)	Fidlin, Römer, Burgert

Competence Certificate
written exam, 180 min.

Prerequisites
none

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

V Vibration Theory

2161212, WS 19/20, 2 SWS, Language: German, Open in study portal

Lecture (V)

Learning Content
Concept of vibration, superposition of vibration with equal and with different frequencies, complex frequency response.

Vibration of systems with one dof: Free undamped and damped vibration, forced vibration for harmonic, periodic and arbitrary excitation. Excitation of undamped vibration in resonance.

Systems with many degrees of freedom: Eigenvalue problem for undamped vibration, orthogonality of eigenvectors, modal decoupling, approximation methods, eigenvalue problem for damped vibration. Forced vibration for harmonic excitation, modal decomposition for arbitrary forced vibration, vibration absorber.

Vibration of systems with distributed parameters: Partial differential equations as equations of motion, wave propagation, d'Alembert's solution, Ansatz for separation of time and space, eigenvalue problem, infinite number of eigenvalues and eigenfunctions.

Introduction to rotor dynamics: Laval rotor in rigid and elastic bearings, inner damping, Laval rotor in anisotropic bearings, synchronous and asynchronous whirl, rotors with asymmetric shaft.

Workload
time of attendance: 22,5 h; self-study: 128 h

Literature
Klotter: Technische Schwingungslehre, Bd. 1 Teil A, Heidelberg, 1978

Hagedorn, Otterbein: Technische Schwingungslehre, Bd 1 and Bd 2, Berlin, 1987

Wittenburg: Schwingungslehre, Springer-Verlag, Berlin, 1995

T 9.158 Course: Virtual Engineering (Specific Topics) [T-MACH-105381]

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

Part of: M-MACH-104919 - Advanced Topics and Methods in Mechanical Engineering 1
M-MACH-105091 - Advanced Topics and Methods in Mechanical Engineering 2

Type	Credits	Recurrence	Version
Oral examination	4	Each summer term	1

Events					
SS 2019	3122031	Virtual Engineering (Specific Topics)	2 SWS	Lecture (V)	Ovtcharova, Mitarbeiter
Exams					
SS 2019	76-T-MACH-105381	Virtual Engineering (Specific Topics)		Prüfung (PR)	Ovtcharova

Competence Certificate
oral exam, 20 min.

Prerequisites
none

T 9.159 Course: VLSI Technology [T-ETIT-100970]

Responsible: Prof. Dr. Michael Siegel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-100465 - VLSI Technology

Type	Credits	Recurrence	Version
Oral examination	3	Each winter term	1

Events					
WS 19/20	2312688	Integrated Systems and Circuits	2 SWS	Lecture (V)	Siegel
Exams					
SS 2019	7312660	VLSI Technology		Prüfung (PR)	Siegel
WS 19/20	7312660	VLSI Technology		Prüfung (PR)	Siegel

Prerequisites
none

T 9.160 Course: Wearable Robotic Technologies [T-INFO-106557]

Responsible: Prof. Dr.-Ing. Tamim Asfour
Prof. Dr.-Ing. Michael Beigl
Organisation: KIT Department of Informatics
Part of: M-INFO-103294 - Wearable Robotic Technologies

Type	Credits	Recurrence	Version
Written examination	4	Each summer term	3

Events					
SS 2019	2400062	Wearable Robotic Technologies	2 SWS	Lecture (V)	Asfour, Beigl, Beil
Exams					
SS 2019	7500219	Wearable Robotic Technologies		Prüfung (PR)	Asfour
WS 19/20	7500073	Wearable Robotic Technologies		Prüfung (PR)	Asfour

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

V Wearable Robotic Technologies

Lecture (V)

2400062, SS 2019, 2 SWS, Language: German/English, Open in study portal

Learning Content

The lecture starts with an overview of wearable robot technologies (exoskeletons, prostheses and ortheses) and its potentials, followed by the basics of wearable robotics. In addition to different approaches to the design of wearable robots and their related actuator and sensor technology, the lecture focuses on modeling the neuromusculoskeletal system of the human body and the physical and cognitive human-robot interaction for tightly coupled hybrid human-robot systems. Examples of current research and various applications of lower, upper and full body exoskeletons as well as prostheses are presented.

Workload

120h

T 9.161 Course: Wildcard Additional Examinations 1 [T-MACH-106638]

Organisation: University
Part of: M-MACH-104332 - Further Examinations

Type	Credits	Recurrence	Version
Completed coursework	3	Each term	1

T 9.162 Course: Wildcard Additional Examinations 10 [T-MACH-106650]

Organisation: University
Part of: M-MACH-104332 - Further Examinations

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

T 9.163 Course: Wildcard Additional Examinations 2 [T-MACH-106639]

Organisation: University
Part of: M-MACH-104332 - Further Examinations

Type	Credits	Recurrence	Version
Completed coursework	3	Each term	1

T 9.164 Course: Wildcard Additional Examinations 3 [T-MACH-106640]

Organisation: University
Part of: M-MACH-104332 - Further Examinations

Type	Credits	Recurrence	Version
Completed coursework	3	Each term	1

T 9.165 Course: Wildcard Additional Examinations 4 [T-MACH-106641]

Organisation: University
Part of: M-MACH-104332 - Further Examinations

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

T 9.166 Course: Wildcard Additional Examinations 5 [T-MACH-106643]

Organisation: University
Part of: M-MACH-104332 - Further Examinations

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

T 9.167 Course: Wildcard Additional Examinations 6 [T-MACH-106646]

Organisation: University
Part of: M-MACH-104332 - Further Examinations

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

T 9.168 Course: Wildcard Additional Examinations 7 [T-MACH-106647]

Organisation: University
Part of: M-MACH-104332 - Further Examinations

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

T 9.169 Course: Wildcard Additional Examinations 8 [T-MACH-106648]

Organisation: University
Part of: M-MACH-104332 - Further Examinations

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

T 9.170 Course: Wildcard Additional Examinations 9 [T-MACH-106649]

Organisation: University

Part of: M-MACH-104332 - Further Examinations

Type	Credits	Recurrence	Version
Examination of another type	3	Each term	1

T 9.171 Course: Workshop Mechatronical Systems and Products [T-MACH-108680]

Responsible: Prof. Dr.-Ing. Albert Albers
Prof. Dr.-Ing. Sören Hohmann
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102749 - Mechatronical Systems and Products

Type	Credits	Recurrence	Version
Examination of another type	3	Each winter term	3

Events					
WS 19/20	2145162	Workshop Mechatronical Systems and Products	2 SWS	Practical course (P)	Matthiesen, Hohmann

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.

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

V Workshop Mechatronical Systems and Products

2145162, WS 19/20, 2 SWS, Language: German, Open in study portal

Practical course (P)

Literature

Alt, Oliver (2012): Modell-basierte Systementwicklung mit SysML. In der Praxis. In: Modellbasierte Systementwicklung mit SysML.

Janschek, Klaus (2010): Systementwurf mechatronischer Systeme. Methoden - Modelle - Konzepte. Berlin, Heidelberg: Springer.

Weilkiens, Tim (2008): Systems engineering mit SysML/UML. Modellierung, Analyse, Design. 2., aktualisierte u. erw. Aufl. Heidelberg: Dpunkt-Verl.

T 9.172 Course: Workshop Practical Design of Control Systems [T-ETIT-108117]

Responsible: Prof. Dr.-Ing. Sören Hohmann
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-103814 - Practical Design of Control Systems

Type	Credits	Recurrence	Version
Completed coursework (practical)	0	Each winter term	2