Karlsruher Institut für Technologie

Module Handbook
Bachelor's Program Mechanical Engineering (B.Sc.)

SPO 2023

Summer term 2024

Date: 23/02/2024

KIT DEPARTMENT OF MECHANICAL ENGINEERING

Table Of Contents

1 General Information

1.1 Study program details

KIT-Department	KIT Department of Mechanical Engineering
Academic Degree	Bachelor of Science (B.Sc.)
Examination Regulations Version	2023
Regular terms	6 terms
Maximum terms	10 terms
Credits	180
Language	
Grade calculation	Weighted by (Weight * CP)
Additional Information	Link to study program www.mach.kit.edu

2 About this handbook

2.1 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).

2.1.1 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.

2.1.2 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.

2.1.3 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.

2.1.4 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.

2.1.5 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.

2.1.6 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.

2.1.7 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 Goals
Mechanical Engineering (B.Sc.)

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

In the fundamental area of the studies, graduates acquire sound basic knowledge in engineering. 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 mechanical engineering.

Within the project that is part of fundamentals, in the specialization, during the internship, and in the 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's degree program in mechanical engineering 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, taking into account technical, economic, and social constraints.

Die Forschungsuniversität in der Helmholtz-Gemeinschaft

Amtliche Bekanntmachung

2023 **Ausgegeben Karlsruhe, den 28. April 2023** **Nr. 41**

I n h a l t **Seite**

203

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

vom 27. April 2023

Aufgrund von § 10 Absatz 2 Ziffer 4 und § 20 Absatz 2 KIT-Gesetz - KITG in der Fassung vom 14. Juli 2009 (GBl. S. 317 f), zuletzt geändert durch Artikel 2 des Gesetzes zur Änderung des Universitätsklinika-Gesetzes und anderer Gesetze vom 15. November 2022 (GBl. S. 585), und § 32 Absatz 3 Satz 1, § 32 a Absatz 1 Satz 1 Landeshochschulgesetz in der Fassung vom 1. Januar 2005 (Gbl. S. 1 f.) zuletzt geändert durch Artikel 8 des Gesetzes zum Erlass eines Klimaschutz- und Klimawandelanpassungsgesetz und zur Verankerung des Klimabelangs in weiteren Rechtsvorschriften vom 07. Februar 2023 (GBl. S. 26, 43) hat der KIT-Senat am 17. April 2023 die folgende Studien- und Prüfungsordnung für den Bachelorstudiengang Maschinenbau beschlossen.

Der Präsident hat seine Zustimmung gemäß § 20 Absatz 2 KIT-Gesetz i.V.m. § 32 Absatz 3 Satz 1 Landeshochschulgesetz am 27. April 2023 erteilt.

Inhaltsverzeichnis

205

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

[1]Diese Bachelorprüfungsordnung regelt Studienablauf, Prüfungen und den Abschluss des Studiums im Bachelorstudiengang Maschinenbau am KIT.

§ 2 Ziel des Studiums, akademischer Grad

(1) [1]Im Bachelorstudium sollen die wissenschaftlichen Grundlagen und die Methodenkompetenz der Fachwissenschaften vermittelt werden. [2]Ziel des Studiums ist die Fähigkeit, einen konsekutiven Masterstudiengang erfolgreich absolvieren zu können sowie das erworbene Wissen berufsfeldbezogen anwenden zu können.

(2) [1]Aufgrund der bestandenen Bachelorprüfung wird der akademische Grad „Bachelor of Science (B.Sc.)“ für den Bachelorstudiengang Maschinenbau verliehen.

§ 3 Regelstudienzeit, Studienaufbau, Leistungspunkte

(1) [1]Der Studiengang nimmt teil am Programm „Studienmodelle individueller Geschwindigkeit“. [2]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) [1]Die Regelstudienzeit beträgt sechs Semester. [2]Bei einer qualifizierten Teilnahme am MINT-Kolleg bleiben bei der Anrechnung auf die Regelstudienzeit bis zu zwei Semester unberücksichtigt. [3]Die konkrete Anzahl der Semester richtet sich nach § 8 Absatz 2 Satz 3 bis 5.Eine qualifizierte Teilnahme liegt vor, wenn die/der Studierende Veranstaltungen des MINT-Kollegs für die Dauer von mindestens einem Semester im Umfang von mindestens zwei Fachkursen (Gesamtworkload 10 Semesterwochenstunden) belegt hat. [4]Das MINT-Kolleg stellt hierüber eine Bescheinigung aus.

(3) [1]Das Lehrangebot des Studiengangs ist in Fächer, die Fächer sind in Module, die jeweiligen Module in Lehrveranstaltungen gegliedert. [2]Die Fächer und ihr Umfang werden in § 20 festgelegt. Näheres beschreibt das Modulhandbuch.

(4) [1]Der für das Absolvieren von Lehrveranstaltungen und Modulen vorgesehene Arbeitsaufwand wird in Leistungspunkten (LP) ausgewiesen. [2]Die Maßstäbe für die Zuordnung von Leistungspunkten entsprechen dem European Credit Transfer System (ECTS). [3]Ein Leistungspunkt entspricht einem Arbeitsaufwand von etwa 30 Zeitstunden. [4]Die Verteilung der Leistungspunkte auf die Semester hat in der Regel gleichmäßig zu erfolgen.

(5) [1]Der Umfang der für den erfolgreichen Abschluss des Studiums erforderlichen Studien- und Prüfungsleistungen wird in Leistungspunkten gemessen und beträgt insgesamt 180 Leistungspunkte.

(6) [1]Lehrveranstaltungen können nach vorheriger Ankündigung auch in englischer Sprache angeboten werden, sofern es deutschsprachige Wahlmöglichkeiten gibt.

§ 4 Modulprüfungen, Studien- und Prüfungsleistungen

(1) [1]Die Bachelorprüfung besteht aus Modulprüfungen. [2]Modulprüfungen bestehen aus einer oder mehreren Erfolgskontrollen.

[3]Erfolgskontrollen gliedern sich in Studien- oder Prüfungsleistungen.

(2) [1]Prüfungsleistungen sind:

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

(3) [1]Studienleistungen sind schriftliche, mündliche oder praktische Leistungen, die von den Studierenden in der Regel lehrveranstaltungsbegleitend erbracht werden. [2]Die Bachelorprüfung darf nicht mit einer Studienleistung abgeschlossen werden.

(4) [1]Von den Modulprüfungen sollen mindestens 70 % benotet sein.

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

§ 5 Anmeldung und Zulassung zu den Modulprüfungen und Lehrveranstaltungen

(1) [1]Um an den Modulprüfungen teilnehmen zu können, müssen sich die Studierenden online im Studierendenportal zu den jeweiligen Erfolgskontrollen anmelden. [2]In Ausnahmefällen kann eine Anmeldung schriftlich beim Prüfungsausschuss erfolgen. [3]Für die Erfolgskontrollen können durch die Prüfenden Anmeldefristen festgelegt werden. [4]Die Anmeldung der Bachelorarbeit erfolgt im Studierendenportal, Näheres ist im Modulhandbuch geregelt.

(2) [1]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. [2]Auf Antrag des/der Studierenden an den Prüfungsausschuss kann die Wahl oder die Zuordnung nachträglich geändert werden. [3]Sofern bereits ein Prüfungsverfahren in einem Modul begonnen wurde, ist die Änderung der Wahl oder der Zuordnung erst nach Beendigung des Prüfungsverfahrens zulässig; dies gilt nur für Prüfungsleistungen.

(3) [1]Zu einer Erfolgskontrolle ist zuzulassen, wer

1. in den Bachelorstudiengang Maschinenbau am KIT eingeschrieben ist; die Zulassung beurlaubter Studierender ist auf Prüfungsleistungen im Sinne des § 14 Absatz 7 Satz 1 der Zulassungs- und Immatrikulationsordnung des KIT beschränkt; und
2. nachweist, dass er die im Modulhandbuch für die Zulassung zu einer Erfolgskontrolle festgelegten Voraussetzungen erfüllt, und
3. nachweist, dass er in dem Bachelorstudiengang Maschinenbau den Prüfungsanspruch nicht verloren hat und
4. die in § 20 a genannte Voraussetzung erfüllt.

(4) [1]Nach Maßgabe von § 30 Absatz 5 Landeshochschulgesetz kann die Zulassung zu einzelnen Pflichtveranstaltungen beschränkt werden. [2]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 § 4 Absatz 1 Satz 1 und 2 der Satzung über nachteilsausgleichende Regelungen in den Bachelor- und Masterstudiengängen am Karlsruher Institut für Technologie (KIT) in der jeweils geltenden Fassung, sofern ein Abbau des Überhangs durch andere oder zusätzliche Veranstaltungen nicht möglich ist. [3]Für den Fall gleichen Studienfortschritts sind durch die KIT-Fakultäten weitere Kriterien festzulegen. [4]Das Ergebnis wird den Studierenden rechtzeitig bekannt gegeben.

(5) [1]Die Zulassung ist abzulehnen, wenn die in Absatz 3 und 4 genannten Voraussetzungen nicht erfüllt sind.

§ 6 Durchführung von Erfolgskontrollen

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

(2) [1]Die Art der Erfolgskontrolle (§ 4 Absatz 2 Nummer 1 bis 3, Absatz 3) wird von der/dem Prüfenden der betreffenden Lehrveranstaltung in Bezug auf die Lerninhalte der Lehrveranstaltung und die Lernziele des Moduls festgelegt. [2]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. [3]Im Einvernehmen von Prüfender bzw. Prüfendem und Studierender bzw. Studierendem können die Art der Prüfungsleistung sowie die Prüfungssprache auch nachträglich geändert werden; im ersten Fall ist jedoch § 4 Absatz 5 zu berücksichtigen. [4]Bei der Prüfungsorganisation sind die Belange Studierender mit in besonderen Lebenslagen gemäß § 4 Absatz 1 der Satzung über nachteilsausgleichende Regelungen in den Bachelor- und Masterstudiengängen am Karlsruher Institut für Technologie (KIT) in der jeweils geltenden Fassung zu berücksichtigen. [5]§ 2 und § 4 Absatz 1 Satz 3 der Satzung über nachteilsausgleichende Regelungen in den Bachelor- und Masterstudiengängen am Karlsruher Institut für Technologie (KIT) in der jeweils geltenden Fassung gelten entsprechend.

(3) [1]Bei unvertretbar hohem Prüfungsaufwand kann eine schriftlich durchzuführende Prüfungsleistung auch mündlich, oder eine mündlich durchzuführende Prüfungsleistung auch schriftlich abgenommen werden. [2]Diese Änderung muss mindestens sechs Wochen vor der Prüfungsleistung bekannt gegeben werden.

(4) [1]Bei Lehrveranstaltungen in englischer Sprache (§ 3 Absatz 5) können die entsprechenden Erfolgskontrollen in dieser Sprache abgenommen werden. [2]§ 6 Absatz 2 gilt entsprechend.

(5) [1]*Schriftliche Prüfungen* (§ 4 Absatz 2 Nummer 1) sind in der Regel von einer/einem Prüfenden nach § 18 Absatz 2 oder 3 zu bewerten. [2]Sofern eine Bewertung durch mehrere Prüfende erfolgt, ergibt sich die Note aus dem arithmetischen Mittel der Einzelbewertungen. [3]Entspricht das arithmetische Mittel keiner der in § 7 Absatz 2 Satz 2 definierten Notenstufen, so ist auf die nächstliegende Notenstufe auf- oder abzurunden. [4]Bei gleichem Abstand ist auf die nächstbessere Notenstufe zu runden. [5]Das Bewertungsverfahren soll sechs Wochen nicht überschreiten. [6]Schriftliche Prüfungen dauern mindestens 60 und höchstens 300 Minuten.

(6) [1]*Mündliche Prüfungen* (§ 4 Absatz 2 Nummer 2) sind von mehreren Prüfenden (Kollegialprüfung) oder von einer/m Prüfenden in Gegenwart einer oder eines Beisitzenden als Gruppen- oder Einzelprüfungen abzunehmen und zu bewerten. [2]Vor der Festsetzung der Note hört die/der Prüfende die anderen an der Kollegialprüfung mitwirkenden Prüfenden an. [3]Mündliche Prüfungen dauern in der Regel mindestens 15 Minuten und maximal 60 Minuten pro Studierenden.

[4]Die wesentlichen Gegenstände und Ergebnisse der *mündlichen Prüfung* sind in einem Protokoll festzuhalten. [5]Das Ergebnis der Prüfung ist den Studierenden im Anschluss an die mündliche Prüfung bekannt zu geben.

[6]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. [7]Die Zulassung erstreckt sich nicht auf die Beratung und Bekanntgabe der Prüfungsergebnisse.

(7) [1]Für *Prüfungsleistungen anderer Art* (§ 4 Absatz 2 Nummer 3) sind angemessene Bearbeitungsfristen einzuräumen und Abgabetermine festzulegen. [2]Dabei ist durch die Art der Aufgabenstellung und durch entsprechende Dokumentation sicherzustellen, dass die erbrachte Prüfungsleistung dem/der Studierenden zurechenbar ist. [3]Die wesentlichen Gegenstände und Ergebnisse einer solchen Erfolgskontrolle sind in einem Protokoll festzuhalten.

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

[5]*Schriftliche Arbeiten* im Rahmen einer *Prüfungsleistung anderer Art* haben dabei die folgende Erklärung zu tragen: „Ich versichere wahrheitsgemäß, die Arbeit selbstständig angefertigt, alle benutzten Quellen und 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.“ [6]Trägt die Arbeit diese Erklärung nicht, wird sie nicht angenommen. [7]Die wesentlichen Gegenstände und Ergebnisse der Erfolgskontrolle sind in einem Protokoll festzuhalten.

§ 6 a Erfolgskontrollen im Antwort-Wahl-Verfahren

[1]Für die Durchführung von Erfolgskontrollen im Antwort-Wahl-Verfahren findet die Satzung des Karlsruher Instituts für Technologie (KIT) zur Durchführung von Erfolgskontrollen im Antwort-Wahl-Verfahren in der jeweils gültigen Fassung Anwendung.

§ 6 b Online-Prüfungen

[1]Für die Durchführung von Online-Prüfungen findet die Satzung zur Durchführung von Online-Prüfungen am Karlsruher Institut für Technologie (KIT) in der jeweils gültigen Fassung Anwendung.

§ 7 Bewertung von Studien- und Prüfungsleistungen

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

(2) [1]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.

[2]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) [1]Studienleistungen werden mit „bestanden“ oder mit „nicht bestanden“ gewertet.

209

(4) [1]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) [1]Jedes Modul und jede Erfolgskontrolle darf in demselben Studiengang nur einmal gewertet werden.

(6) [1]Eine Prüfungsleistung ist bestanden, wenn die Note mindestens „ausreichend" (4,0) ist.

(7) [1]Die Modulprüfung ist bestanden, wenn alle erforderlichen Erfolgskontrollen bestanden sind. [2]Die Modulprüfung und die Bildung der Modulnote sollen im Modulhandbuch geregelt werden. [3]Sofern das Modulhandbuch keine Regelung über die Bildung der Modulnote enthält, errechnet sich die Modulnote aus einem nach den Leistungspunkten der einzelnen Teilmodule gewichteten Notendurchschnitt. [4]Die differenzierten Noten (Absatz 2) sind bei der Berechnung der Modulnoten als Ausgangsdaten zu verwenden.

(8) [1]Die Ergebnisse der Erfolgskontrollen sowie die erworbenen Leistungspunkte werden durch den Studierendenservice des KIT verwaltet.

(9) [1]Die Noten der Module eines Faches gehen in die Fachnote mit einem Gewicht proportional zu den ausgewiesenen Leistungspunkten der Module ein.

(10) [1]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) [1]Die Teilmodulprüfungen Höhere Mathematik I sowie Technische Mechanik I in den Modulen Höhere Mathematik und Technische Mechanik sind bis zum Ende des zweiten Fachsemesters abzulegen (Orientierungsprüfungen).

(2) [1]Wer die Orientierungsprüfungen einschließlich etwaiger Wiederholungen bis zum Ende 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. [2]Eine zweite Wiederholung der Orientierungsprüfungen ist ausgeschlossen.

[3]Die Fristüberschreitung hat die/der Studierende insbesondere dann nicht zu vertreten, wenn eine qualifizierte Teilnahme am MINT-Kolleg im Sinne von § 3 Absatz 2 vorliegt. [4]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 Absatz 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 Absatz 2 im Umfang von zwei Semestern nachweist.

[5]Als Nachweis gilt die vom MINT-Kolleg gemäß § 3 Absatz 2 auszustellende Bescheinigung, die beim Studierendenservice des KIT einzureichen ist. [6]Im Falle von Nummer 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) [1]Ist die Bachelorprüfung bis zum Ende des zehnten Fachsemesters einschließlich etwaiger Wiederholungen nicht vollständig abgelegt, so erlischt der Prüfungsanspruch im Bachelorstudiengang Maschinenbau, es sei denn, dass die Fristüberschreitung nicht selbst zu vertreten ist. [2]Die Entscheidung über eine Fristverlängerung und über Ausnahmen von der Fristregelung trifft der Prüfungsausschuss unter Beachtung der in § 32 Absatz 6 Landeshochschulgesetz genannten Tätigkeiten auf Antrag des/der Studierenden. [3]Der Antrag ist schriftlich in der Regel bis sechs Wochen vor Ablauf der in Satz 1 genannten Studienhöchstdauer zu stellen. [4]Absatz 2 Satz 3 bis 5 gelten entsprechend.

(4) [1]Der Prüfungsanspruch geht auch verloren, wenn eine nach dieser Studien- und Prüfungsordnung erforderliche Studien- oder Prüfungsleistung endgültig nicht bestanden ist.

§ 9 Wiederholung von Erfolgskontrollen, endgültiges Nichtbestehen

(1) [1]Studierende können eine nicht bestandene schriftliche Prüfung (§ 4 Absatz 2 Nummer 1) einmal wiederholen. [2]Wird eine schriftliche Wiederholungsprüfung mit „nicht ausreichend" (5,0) bewertet, so erfolgt in zeitlichem Zusammenhang eine mündliche Fortsetzung der Wiederholungsprüfung (mündliche Nachprüfung). [3]Die Note der Wiederholungsprüfung, die in diesem Fall nur „ausreichend" (4,0) oder „nicht ausreichend" (5,0) lauten kann, wird von den Prüfenden bzw. der/dem Prüfenden unter angemessener Berücksichtigung der schriftlichen Leistung und des Ergebnisses der mündlichen Nachprüfung festgesetzt. [4]Mündliche Nachprüfungen dauern in der Regel mindestens 15 Minuten und maximal 30 Minuten. § 6 Absatz 6 Satz 1 und 2 sowie Satz 4 und 5 gelten entsprechend. [5]Sofern gemäß § 11 eine schriftliche Wiederholungsprüfung als mit „nicht ausreichend" (5,0) bewertet gilt, ist eine mündliche Nachprüfung ausgeschlossen.

(2) [1]Studierende können eine nicht bestandene mündliche Prüfung (§ 4 Absatz 2 Nummer 2) einmal wiederholen.

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

(4) [1]Prüfungsleistungen anderer Art (§ 4 Absatz 2 Nummer 3) können einmal wiederholt werden.

(5) [1]Studienleistungen können mehrfach wiederholt werden.

(6) [1]Die Prüfungsleistung ist endgültig nicht bestanden, wenn die mündliche Nachprüfung im Sinne des Absatzes 1 mit „nicht ausreichend" (5,0) bewertet wurde. [2]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.

(7) [1]Das Modul ist endgültig nicht bestanden, wenn eine für sein Bestehen erforderliche Prüfungsleistung endgültig nicht bestanden ist.

(8) [1]Eine zweite Wiederholung derselben Prüfungsleistung gemäß § 4 Absatz 2 ist nur in Ausnahmefällen auf Antrag des/der Studierenden zulässig („Antrag auf Zweitwiederholung"). [2]Der Antrag ist schriftlich beim Prüfungsausschuss in der Regel bis zwei Monate nach Bekanntgabe der Note zu stellen.

[3]Über den ersten Antrag eines/r Studierenden auf Zweitwiederholung entscheidet der Prüfungsausschuss, wenn er den Antrag genehmigt. [4]Wenn der Prüfungsausschuss diesen Antrag ablehnt, entscheidet ein Mitglied des Präsidiums. [5]Über weitere Anträge auf Zweitwiederholung entscheidet nach Stellungnahme des Prüfungsausschusses ein Mitglied des Präsidiums. [6]Wird der Antrag genehmigt, hat die Zweitwiederholung spätestens zum übernächsten Prüfungstermin zu erfolgen. [7]Absatz 1 Satz 2 und 3 gelten entsprechend.

(9) [1]Die Wiederholung einer bestandenen Prüfungsleistung ist nicht zulässig.

(10) [1]Die Bachelorarbeit kann bei einer Bewertung mit „nicht ausreichend" (5,0) einmal wiederholt werden. [2]Eine zweite Wiederholung der Bachelorarbeit ist ausgeschlossen. [3]Die Präsentation nach § 14 Absatz 1 a ist eine Studienleistung und kann bei einer Bewertung mit „nicht bestanden (not passed)" (im Gegensatz zu anderen Studienleistungen) nur einmal wiederholt werden. [4]Die Präsentation ist endgültig nicht bestanden, wenn sie zweimal mit „nicht bestanden" (not passed) bewertet wurde.

§ 10 Abmeldung; Versäumnis, Rücktritt

(1) [1]Studierende können ihre Anmeldung zu *schriftlichen Prüfungen* ohne Angabe von Gründen bis zur Ausgabe der Prüfungsaufgaben widerrufen (Abmeldung). [2]Eine Abmeldung kann online im Studierendenportal bis 24:00 Uhr des Vortages der Prüfung oder in begründeten Ausnahmefällen beim Prüfungsausschuss erfolgen. [3]Erfolgt die Abmeldung gegenüber dem/der Prüfenden hat diese/r Sorge zu tragen, dass die Abmeldung im Campus Management System verbucht wird.

(2) [1]Bei *mündlichen Prüfungen* muss die Abmeldung spätestens drei Werktage vor dem betreffenden Prüfungstermin gegenüber dem/der Prüfenden erklärt werden. [2]Der Rücktritt von einer mündlichen Prüfung weniger als drei Werktage vor dem betreffenden Prüfungstermin ist nur unter den Voraussetzungen des Absatzes 5 möglich. [3]Der Rücktritt von mündlichen Nachprüfungen im Sinne von § 9 Absatz 1 ist grundsätzlich nur unter den Voraussetzungen von Absatz 5 möglich.

(3) [1]Die Abmeldung von *Prüfungsleistungen anderer Art* sowie von *Studienleistungen* ist im Modulhandbuch geregelt.

(4) [1]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. [2]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) [1]Der für den Rücktritt nach Beginn der Erfolgskontrolle oder das Versäumnis geltend gemachte Grund muss dem Prüfungsausschuss unverzüglich schriftlich angezeigt und glaubhaft gemacht werden. [2]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) [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) [1]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. [2]In diesem Fall gilt die betreffende Erfolgskontrolle als mit „nicht ausreichend" (5,0) bewertet. [3]In schwerwiegenden Fällen kann der Prüfungsausschuss diese Studierenden von der Erbringung weiterer Erfolgskontrollen ausschließen.

(3) [1]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]Für den Ausgleich von Nachteilen bei Studierenden in besonderen Lebenslagen findet die Satzung über nachteilsausgleichende Regelungen in den Bachelor- und Masterstudiengängen am Karlsruher Institut für Technologie (KIT) in der jeweils geltenden Fassung Anwendung.

§ 13 Studierende mit Behinderung oder chronischer Erkrankung

[1]Für den Ausgleich von Nachteilen bei Studierenden in besonderen Lebenslagen findet die Satzung über nachteilsausgleichende Regelungen in den Bachelor- und Masterstudiengängen am Karlsruher Institut für Technologie (KIT) in der jeweils geltenden Fassung Anwendung.

§ 14 Modul Bachelorarbeit

(1) [1]Voraussetzung für die Zulassung zum Modul Bachelorarbeit ist, dass die/der Studierende Modulprüfungen im Umfang von 120 LP erfolgreich abgelegt hat. [2]Über Ausnahmen entscheidet der Prüfungsausschuss auf Antrag der/des Studierenden.

(1 a) [1]Dem Modul Bachelorarbeit sind 15 LP zugeordnet. [2]Es besteht aus der Bachelorarbeit (mit 12 LP) und einer Präsentation (mit 3 LP). [3]Die Präsentation soll spätestens sechs Wochen nach Abgabe der Bachelorarbeit erfolgen.

(2) [1]Die Bachelorarbeit kann von Hochschullehrerinnen und Hochschullehrern am KIT und habilitierten Mitgliedern der KIT-Fakultät für Maschinenbau vergeben werden. [2]Darüber hinaus kann der Prüfungsausschuss weitere Prüfende gemäß § 18 Absatz 2 und 3 zur Vergabe des Themas berechtigen. [3]Den Studierenden ist Gelegenheit zu geben, für das Thema Vorschläge zu machen. [4]Soll die Bachelorarbeit außerhalb der KIT-Fakultät für Maschinenbau angefertigt werden, so bedarf dies der Genehmigung durch den Prüfungsausschuss. [5]Die Bachelorarbeit kann auch in Form einer Gruppenarbeit zugelassen werden, wenn der als Prüfungsleistung zu bewertende Beitrag der/des einzelnen Studierenden aufgrund objektiver Kriterien, die eine eindeutige Abgrenzung ermöglichen, deutlich unterscheidbar ist und die Anforderung nach Absatz 4 erfüllt. [6]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. [7]Die Ausgabe des Themas erfolgt in diesem Fall über die/den Vorsitzende/n des Prüfungsausschusses.

(3) [1]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) [1]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. [2]Der Umfang der Bachelorarbeit entspricht 12 Leistungspunkten. [3]Die maximale Bearbeitungsdauer beträgt drei Monate. [4]Thema und Aufgabenstellung sind an den vorgesehenen Umfang anzupassen. [5]Der Prüfungsausschuss legt fest, in welchen Sprachen die Bachelorarbeit geschrieben werden kann. [6]Auf Antrag des Studierenden kann der/die Prüfende genehmigen, dass die Bachelorarbeit in einer anderen Sprache als Deutsch geschrieben wird.

(5) [1]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. [2]Wenn diese Erklärung nicht enthalten ist, wird die Arbeit nicht angenommen. [3]Die Erklärung lautet wie folgt: „Ich versichere wahrheitsgemäß, die Arbeit selbstständig verfasst, alle benutzten Quellen und 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.“ [4]Bei Abgabe einer unwahren Versicherung wird die Bachelorarbeit mit „nicht ausreichend“ (5,0) bewertet.

(6) [1]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. [2]Der Zeitpunkt der Abgabe der Bachelorarbeit ist durch den/die Prüfende/n beim Prüfungsausschuss aktenkundig zu machen. [3]Das Thema kann nur einmal und nur innerhalb des ersten Monats der Bearbeitungszeit zurückgegeben werden. [4]Macht der oder die Studierende einen triftigen Grund geltend, kann der Prüfungsausschuss die in Absatz 4 festgelegte Bearbei-

213

tungszeit auf Antrag der oder des Studierenden um höchstens einen Monat verlängern. [5]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) [1]Die Bachelorarbeit wird von mindestens einer Hochschullehrerin oder einem Hochschullehrer am KIT oder einem habilitierten Mitglied der KIT-Fakultät für Maschinenbau und einem/einer weiteren Prüfenden bewertet. [2]In der Regel ist eine/r der Prüfenden die Person, die die Arbeit gemäß Absatz 2 vergeben hat. [3]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 eine/n weitere/n Gutachter/in bestellen. [4]Die Bewertung hat innerhalb von sechs Wochen nach Abgabe der Bachelorarbeit zu erfolgen.

§ 14 a Berufspraktikum

(1) [1]Während des Bachelorstudiums ist ein mindestens 12-wöchiges Berufspraktikum abzuleisten, welches geeignet ist, den Studierenden eine Anschauung von berufspraktischer Tätigkeit im Maschinenbau zu vermitteln. [2]Dem Berufspraktikum sind 12 Leistungspunkte zugeordnet.

(2) [1]Die Studierenden setzen sich in eigener Verantwortung mit geeigneten Einrichtungen in der Industrie in Verbindung, an denen das Praktikum abgeleistet werden kann. [2]Berufspraktika in öffentlichen Forschungseinrichtungen sind ausgeschlossen. [3]Das Nähere regelt das Modulhandbuch.

§ 15 Zusatzleistungen

(1) [1]Es können auch weitere Leistungspunkte (Zusatzleistungen) im Umfang von höchstens 30 LP aus dem Gesamtangebot des KIT erworben werden. [2]§ 3 und § 4 der Prüfungsordnung bleiben davon unberührt. [3]Diese Zusatzleistungen gehen nicht in die Festsetzung der Gesamt- und Modulnoten ein. [4]Die bei der Festlegung der Modulnote nicht berücksichtigten LP werden als Zusatzleistungen im Transcript of Records aufgeführt und als Zusatzleistungen gekennzeichnet. [5]Auf Antrag der/des Studierenden werden die Zusatzleistungen in das Bachelorzeugnis aufgenommen und als Zusatzleistungen gekennzeichnet. [6]Zusatzleistungen werden mit den nach § 7 vorgesehenen Noten gelistet.

(2) [1]Die Studierenden haben bereits bei der Anmeldung zu einer Prüfung in einem Modul diese als Zusatzleistung zu deklarieren.

§ 15 a Mastervorzug

[1]Studierende, die im Bachelorstudium bereits mindestens 120 LP erworben haben, können zusätzlich zu den in § 15 Absatz 1 genannten Zusatzleistungen Leistungspunkte aus einem konsekutiven Masterstudiengang am KIT im Umfang von höchstens 30 LP erwerben (Mastervorzugsleistungen). [2]§ 3 und § 4 der Prüfungsordnung bleiben davon unberührt. [3]Die Mastervorzugsleistungen gehen nicht in die Festsetzung der Gesamt-, Fach- und Modulnoten ein. [4]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

[1]Neben der Vermittlung von fachlichen Qualifikationen ist der Auf- und Ausbau überfachlicher Qualifikationen im Umfang von 6 LP Bestandteil eines Bachelorstudiums. [2]Überfachliche Qualifikationen können additiv oder integrativ vermittelt werden.

§ 17 Prüfungsausschuss

(1) [1]Für den Bachelorstudiengang Maschinenbau wird ein Prüfungsausschuss gebildet. [2]Er besteht aus vier stimmberechtigten Mitgliedern: Zwei Hochschullehrerinnen bzw. Hochschullehrer am KIT / Privatdozentinnen bzw. -dozenten, zwei akademischen Mitarbeiterinnen und akademischen Mitarbeitern am KIT und einer bzw. einem Studierenden mit beratender Stimme. [3]Im Falle der Einrichtung eines gemeinsamen Prüfungsausschusses für den Bachelor- und den Masterstudiengang Maschinenbau erhöht sich die Anzahl der Studierenden auf zwei Mitglieder mit beratender Stimme, wobei je eine bzw. einer dieser Beiden aus dem Bachelor- und aus dem Masterstudiengang stammen soll. [4]Die Amtszeit der nichtstudentischen Mitglieder beträgt zwei Jahre, die des studentischen Mitglieds ein Jahr.

(2) [1]Die/der Vorsitzende, ihre/sein Stellvertreter/in, die weiteren Mitglieder des Prüfungsausschusses sowie deren Stellvertreter/innen werden von dem KIT-Fakultätsrat bestellt, die akademischen Mitarbeiterinnen bzw. akademischen Mitarbeiter am KIT und die Studierenden auf Vorschlag der Mitglieder der jeweiligen Gruppe; Wiederbestellung ist möglich. [2]Die/der Vorsitzende und deren/dessen Stellvertreter/in müssen Hochschullehrerinnen oder Hochschullehrer am KIT sein. [3]Die/der Vorsitzende des Prüfungsausschusses nimmt die laufenden Geschäfte wahr und wird durch das jeweilige Prüfungssekretariat unterstützt.

(3) [1]Der Prüfungsausschuss achtet auf die Einhaltung der Bestimmungen dieser Studien- und Prüfungsordnung und fällt die Entscheidungen in Prüfungsangelegenheiten. [2]Er entscheidet über die Anerkennung von Studienzeiten sowie Studien- und Prüfungsleistungen und trifft die Feststellung gemäß § 19 Absatz 1 Satz 1. [3]Er berichtet der KIT-Fakultät regelmäßig über die Entwicklung der Prüfungs- und Studienzeiten, einschließlich der Bearbeitungszeiten für die Bachelorarbeiten und die Verteilung der Modul- und Gesamtnoten. [4]Er ist zuständig für Anregungen zur Reform der Studien- und Prüfungsordnung und zu Modulbeschreibungen. [5]Der Prüfungsausschuss entscheidet mit der Mehrheit seiner Stimmen. [6]Bei Stimmengleichheit entscheidet die/der Vorsitzende des Prüfungsausschusses.

(4) [1]Der Prüfungsausschuss kann die Erledigung seiner Aufgaben für alle Regelfälle auf die/den Vorsitzende/n des Prüfungsausschusses übertragen. [2]In dringenden Angelegenheiten, deren Erledigung nicht bis zu der nächsten Sitzung des Prüfungsausschusses warten kann, entscheidet die/der Vorsitzende des Prüfungsausschusses.

(5) [1]Die Mitglieder des Prüfungsausschusses haben das Recht, der Abnahme von Prüfungen beizuwohnen. [2]Die Mitglieder des Prüfungsausschusses, die Prüfenden und die Beisitzenden unterliegen der Verschwiegenheit. [3]Sofern sie nicht im öffentlichen Dienst stehen, sind sie durch die/den Vorsitzende/n zur Verschwiegenheit zu verpflichten.

(6) [1]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) [1]Belastende Entscheidungen des Prüfungsausschusses sind schriftlich mitzuteilen. [2]Sie sind zu begründen und mit einer Rechtsbehelfsbelehrung zu versehen. [3]Vor einer Entscheidung ist Gelegenheit zur Äußerung zu geben. [4]Widersprüche gegen Entscheidungen des Prüfungsausschusses sind innerhalb eines Monats nach Zugang der Entscheidung bei diesem einzulegen. [5]Über Widersprüche entscheidet das für Lehre zuständige Mitglied des Präsidiums.

§ 18 Prüfende und Beisitzende

(1) [1]Der Prüfungsausschuss bestellt die Prüfenden. [2]Er kann die Bestellung der/dem Vorsitzenden übertragen.

(2) [1]Prüfende sind Hochschullehrinnen bzw. Hochschullehrer am KIT, habilitierte Mitglieder und akademische Mitarbeiterinnen und Mitarbeiter am KIT, welche der KIT-Fakultät angehören und denen die Prüfungsbefugnis gemäß § 14 Absatz 2, § 14 b Absatz 1 Nummer 1 KITG i.V.m. § 52 Absatz 1 Satz 6 Halbsatz 2 Landeshochschulgesetz übertragen wurde. [2]Bestellt werden darf nur, wer mindestens die dem jeweiligen Prüfungsgegenstand entsprechende fachwissenschaftliche Qualifikation erworben hat.

(3) [1]Soweit Lehrveranstaltungen von anderen als den unter Absatz 2 genannten Personen durchgeführt werden, sollen diese zu Prüfenden bestellt werden, sofern sie die gemäß Absatz 2 Satz 2 vorausgesetzte Qualifikation nachweisen können.

(4) [1]Die Beisitzenden werden durch die Prüfenden benannt. [2]Zu Beisitzenden darf nur benannt werden, wer eine dem jeweiligen Prüfungsgegenstand entsprechende fachwissenschaftliche Qualifikation erworben hat.

§ 19 Anerkennung von Studien- und Prüfungsleistungen, Studienzeiten

(1) [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. [2]Dabei ist kein schematischer Vergleich, sondern eine Gesamtbetrachtung vorzunehmen. [3]Bezüglich des Umfangs einer zur Anerkennung vorgelegten Studien- und Prüfungsleistung (Anrechnung) werden die Grundsätze des ECTS herangezogen.

(2) [1]Die Studierenden haben die für die Anerkennung erforderlichen Unterlagen vorzulegen. [2]Studierende, die neu in den Studiengang Maschinenbau immatrikuliert wurden, haben den Antrag mit den für die Anerkennung erforderlichen Unterlagen innerhalb des ersten Semesters nach Immatrikulation zu stellen. [3]Bei Unterlagen, die nicht in deutscher oder englischer Sprache vorliegen, kann eine amtlich beglaubigte Übersetzung verlangt werden. [4]Die Beweislast dafür, dass der Antrag die Voraussetzungen für die Anerkennung nicht erfüllt, liegt beim Prüfungsausschuss.

(3) [1]Werden Leistungen angerechnet, die nicht am KIT erbracht wurden, werden sie im Zeugnis als „anerkannt“ ausgewiesen. [2]Liegen Noten vor, werden die Noten, soweit die Notensysteme vergleichbar sind, übernommen und in die Berechnung der Modulnoten und der Gesamtnote einbezogen. [3]Sind die Notensysteme nicht vergleichbar, können die Noten umgerechnet werden. [4]Liegen keine Noten vor, wird der Vermerk „bestanden“ aufgenommen.

(4) [1]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) [1]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. [2]Die Anrechnung kann in Teilen versagt werden, wenn mehr als 50 Prozent des Hochschulstudiums ersetzt werden soll.

(6) [1]Zuständig für Anerkennung und Anrechnung ist der Prüfungsausschuss. [2]Im Rahmen der Feststellung, ob ein wesentlicher Unterschied im Sinne des Absatz 1 vorliegt, sind die zuständigen Fachvertreter/innen zu hören. [3]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) [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 137 LP,
2. Vertiefung im Maschinenbau: Modul(e) im Umfang von 12 LP,
3. Überfachliche Qualifikationen: Modul(e) im Umfang von 4 LP gemäß § 16.

[2]Die Vermittlung weiterer überfachlicher Qualifikationen im Umfang von 2 LP gemäß § 16 findet im Rahmen fachwissenschaftlicher Module im Fach Ingenieurwissenschaftliche Grundlagen statt.

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

§ 20 a Leistungsnachweise für die Bachelorprüfung

[1]Voraussetzung für die Anmeldung zur letzten Modulprüfung der Bachelorprüfung ist die Bescheinigung über das erfolgreich abgeleistete Berufspraktikum nach § 14 a. [2]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) [1]Die Bachelorprüfung ist bestanden, wenn alle in § 20 genannten Modulprüfungen bestanden sind.

(2) [1]Die Gesamtnote der Bachelorprüfung errechnet sich als ein mit Leistungspunkten gewichteter Notendurchschnitt der Fachnoten in § 20 Absatz 2 Nummer 1 und 2 sowie des Moduls Bachelorarbeit.

[2]Dabei werden die Noten des Moduls Bachelorarbeit jeweils mit dem doppelten Gewicht der Noten der übrigen Fächer berücksichtigt.

(3) [1]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) [1]Über die Bachelorprüfung werden nach Bewertung der letzten Prüfungsleistung eine Bachelorurkunde und ein Zeugnis erstellt. [2]Die Ausfertigung von Bachelorurkunde und Zeugnis soll nicht später als drei Monate nach Ablegen der letzten Prüfungsleistung erfolgen. [3]Bachelorurkunde und Bachelorzeugnis werden in deutscher und englischer Sprache ausgestellt. [4]Bachelorurkunde und Zeugnis tragen das Datum der erfolgreichen Erbringung der letzten Prüfungsleistung. [5]Diese Dokumente werden den Studierenden zusammen ausgehändigt. [6]In der Bachelorurkunde wird die Verleihung des akademischen Bachelorgrades beurkundet. [7]Die Bachelorurkunde wird von dem Präsidenten und der KIT-Dekanin/dem KIT-Dekan der KIT-Fakultät unterzeichnet und mit dem Siegel des KIT versehen.

(2) [1]Das Zeugnis enthält die Fach- und Modulnoten sowie die den Modulen und Fächern zugeordneten Leistungspunkte und die Gesamtnote. [2]Sofern gemäß § 7 Absatz 2 Satz 2 eine differenzierte Bewertung einzelner Prüfungsleistungen vorgenommen wurde, wird auf dem Zeugnis auch die entsprechende Dezimalnote ausgewiesen; § 7 Absatz 4 bleibt unberührt. [3]Das Zeugnis ist von der KIT-Dekanin/dem KIT-Dekan der KIT-Fakultät und von der/dem Vorsitzenden des Prüfungsausschusses zu unterzeichnen.

(3) [1]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) [1]Das Transcript of Records enthält in strukturierter Form alle erbrachten Studien- und Prüfungsleistungen. [2]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. [3]Absatz 2 Satz 2 gilt entsprechend. [4]Aus dem Transcript of Records soll die Zugehörigkeit von Erfolgskontrollen zu den einzelnen Modulen deutlich erkennbar sein. [5]Angerechnete Studien- und Prüfungsleistungen sind im Transcript of Records aufzunehmen. [6]Alle Zusatzleistungen werden im Transcript of Records aufgeführt.

(5) [1]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

[1]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. [2]Dasselbe gilt, wenn der Prüfungsanspruch erloschen ist.

§ 24 Aberkennung des Bachelorgrades

(1) [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. [2]Gegebenenfalls kann die Modulprüfung für „nicht ausreichend" (5,0) und die Bachelorprüfung für „nicht bestanden" erklärt werden.

(2) [1]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. [2]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) [1]Vor einer Entscheidung des Prüfungsausschusses ist Gelegenheit zur Äußerung zu geben.

(4) [1]Das unrichtige Zeugnis ist zu entziehen und gegebenenfalls ein neues zu erteilen. [2]Mit dem unrichtigen Zeugnis ist auch die Bachelorurkunde einzuziehen, wenn die Bachelorprüfung aufgrund einer Täuschung für „nicht bestanden" erklärt wurde.

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

(6) [1]Die Aberkennung des akademischen Grades richtet sich nach § 36 Absatz 7 Landeshochschulgesetz.

§ 25 Einsicht in die Prüfungsakten

(1) [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) [1]Für die Einsichtnahme in die schriftlichen Modulprüfungen, schriftlichen Modulteilprüfungen bzw. Prüfungsprotokolle gilt eine Frist von einem Monat nach Bekanntgabe des Prüfungsergebnisses.

(3) [1]Der/die Prüfende bestimmt Ort und Zeit der Einsichtnahme.

(4) [1]Prüfungsunterlagen sind mindestens fünf Jahre aufzubewahren.

§ 26 Inkrafttreten, Übergangsvorschriften

(1) [1]Diese Studien- und Prüfungsordnung tritt am 1. Oktober 2023 in Kraft und gilt für

1. Studierende, die ihr Studium im Bachelorstudiengang Maschinenbau am KIT im ersten Fachsemester aufnehmen, sowie für
2. Studierende, die ihr Studium im Bachelorstudiengang Maschinenbau am KIT in einem höheren Fachsemester aufnehmen, sofern dieses Fachsemester nicht über dem Fachsemester liegt, das der erste Jahrgang nach Ziffer 1 erreicht.

(2) [1]Die Studien- und Prüfungsordnung des KIT für den Bachelorstudiengang Maschinenbau vom 4. August 2015 (Amtliche Bekanntmachung des KIT Nummer 62 vom 6. August 2015) zuletzt geändert durch Artikel 20 der Satzung zur Änderung der Regelung über die mündliche Nachprüfung in den Studien- und Prüfungsordnungen des Karlsruher Institut für Technologie (KIT) vom 29. März 2023 (Amtliche Bekanntmachung des KIT Nummer 29 vom 30. März 2023) behält Gültigkeit für

1. Studierende, die ihr Studium im Bachelorstudiengang Maschinenbau am KIT zuletzt im Sommersemester 2023 aufgenommen haben, sowie für
2. Studierende, die ihr Studium im Bachelorstudiengang Maschinenbau am KIT ab dem Wintersemester 2023/2024 in einem höheren Fachsemester aufnehmen, sofern das Fachsemester über dem liegt, das der erste Jahrgang nach Absatz 1 Ziffer 1 erreicht hat.

[2]Im Übrigen tritt sie außer Kraft.

(3) [1]Studierende, die auf Grundlage der Studien- und Studien- und Prüfungsordnung des KIT für den Bachelorstudiengang Maschinenbau vom 4. August 2015 (Amtliche Bekanntmachung des KIT Nummer 62 vom 6. August 2015) zuletzt geändert durch Artikel 20 der Satzung zur Änderung der Regelung über die mündliche Nachprüfung in den Studien- und Prüfungsordnungen des Karlsruher Institut für Technologie (KIT) vom 29. März 2023 (Amtliche Bekanntmachung des KIT Nummer 29 vom 30. März 2023) ihr Studium am KIT aufgenommen haben, können Prüfungen auf Grundlage dieser Studien- und Prüfungsordnung letztmalig bis zum 30. September 2029 ablegen.

Karlsruhe, den 27. April 2023

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

Studienplan der KIT-Fakultät für Maschinenbau für den Bachelorstudiengang Maschinenbau gemäß SPO 2023

Gültig ab 01. April 2024

Inhaltsverzeichnis

1 Allgemeine Informationen

1.1 Umfang des Bachelorstudiums, Leistungspunkte

Der Bachelorstudiengang Maschinenbau am Karlsruher Institut für Technologie (KIT) umfasst 180 Leistungspunkte (LP), die gleichmäßig auf die Regelstudienzeit von sechs Semestern verteilt werden, so dass von den Studierenden durchschnittlich 30 LP (± 3 LP) pro Semester erworben werden.

Die Angabe der LP erfolgt gemäß dem „European Credit Transfer and Accumulation System" (ECTS) und basiert auf dem von den Studierenden zu absolvierenden Arbeitspensum. Ein LP entspricht in etwa 30 Stunden studentischer Arbeitszeit. Im Bachelorstudiengang werden für einen LP in der Regel Veranstaltungen im Umfang von 1,5 – 2 Semesterwochenstunden (SWS) angeboten. Eine SWS umfasst 45 Minuten und findet durchschnittlich einmal wöchentlich in der Vorlesungszeit statt. Das restliche von den Studierenden zu absolvierende Arbeitspensum wird im Selbststudium erbracht.

1.2 Modularer Aufbau des Studiums, Erfolgskontrollen

Das Studium ist in Fächer gegliedert, die aus Modulen bestehen. Ein Modul gliedert sich in eine oder mehrere Teilleistungen (TL), die jeweils mit einer Erfolgskontrolle abschließen. Erfolgskontrollen können unbenotet oder benotet sein. Unbenotete Erfolgskontrollen werden als Studienleistung, benotete Erfolgskontrollen als Prüfungsleistung bezeichnet. Studienleistungen werden in der Regel lehrveranstaltungsbegleitend erbracht. Jeder TL ist eine feste Art der Erfolgskontrolle zugeordnet. Genaue Informationen zur Form und ggf. Ausgestaltung der Erfolgskontrolle sind im Modulhandbuch bei den einzelnen TL zu finden.

In einigen Modulen sind einzelne TL miteinander verknüpft. So kann das Bestehen einer Studienleistung Voraussetzung zur Prüfungszulassung sein. Dies ist im Modulhandbuch beschrieben.

1.3 Prüfungsmodalitäten

In jedem Semester wird für Prüfungen mindestens ein Prüfungstermin angeboten. Anmelde- und Prüfungstermine werden rechtzeitig bekanntgegeben, bei schriftlichen Prüfungen mindestens sechs Wochen vor der Prüfung.

Über Hilfsmittel, die bei einer Prüfung benutzt werden dürfen, entscheidet der/die Prüfende. Eine Liste der zugelassenen Hilfsmittel wird gleichzeitig mit der Ankündigung des Prüfungstermins bekanntgegeben.

Prüfungen können in der Regel einmal wiederholt werden. Studienleistungen können solange wiederholt werden, bis diese erfolgreich bestanden wurden.

Zur Berechnung der Modul- und Fachnoten wird auf § 7 in der Studien- und Prüfungsordnung (SPO) verwiesen. Ggf. sind zusätzliche Informationen zur Bildung der Modulnoten in den Modulbeschreibungen zu finden.

1.4 Orientierungsprüfungen

Die Teilmodulprüfungen Höhere Mathematik I und Technische Mechanik I sind Orientierungsprüfungen. Sie sind bis zum Ende des zweiten Fachsemesters abzulegen. Zu weiteren Regelungen wird auf § 8 der SPO verwiesen.

2 Aufbau des Studiengangs

2.1 Übersicht über Fächer, Module und Teilleistungen

Die Tabelle auf den nächsten beiden Seiten zeigt eine Übersicht über Fächer, Module und Teilleistungen im Bachelorstudiengang Maschinenbau. Sowohl für Module als auch für TL sind die entsprechenden LP und bei den TL zusätzlich die Gewichtung der Note innerhalb des Moduls sowie die Art der Erfolgskontrolle angegeben. Die Gewichtung der Prüfungen innerhalb eines Moduls berücksichtigt den Arbeitsaufwand der Vorleistungen (Workshops oder Übungen).

2.2 Exemplarischer Studienplan

Der exemplarische Studienplan auf S. 5 zeigt, wie die Module und Teilleistungen des Studiengangs auf sechs Semester Regelstudienzeit verteilt werden können. In der Übersicht werden Pflichtmodule (blau) von Modulen unterscheiden, in denen die Studierenden eine individuelle Wahl treffen können (grün). Diese Module mit Wahlmöglichkeiten sind in Kapitel 3 näher erläutert.

Fach	Modul und deren/ dessen Verant-wortliche(r)	LP	Teilleistung (TL)		LP	Gewich-tung der TL innerhalb des Moduls	Art der Erfolgs-kon-trolle
Ingenieurwissenschaftliche Grundlagen	M-MATH-102859 Höhere Mathematik (HM) Griesmaier	21	T-MATH-100525	Übungen zu HM I	0	0	Studien-leistung
			T-MATH-100275	Höhere Mathematik I	7	7	Schriftl. Prüfung
			T-MATH-100526	Übungen zu HM II	0	0	Studien-leistung
			T-MATH-100276	Höhere Mathematik II	7	7	Schriftl. Prüfung
			T-MATH-100527	Übungen zu HM III	0	0	Studien-leistung
			T-MATH-100277	Höhere Mathematik III	7	7	Schriftl. Prüfung
	M-MACH-106374 Technische Mechanik (TM) Böhlke/ Proppe	21	T-MACH-112907	Übungen zu TM I	1	0	Studien-leistung
			T-MACH-112904	Technische Mechanik I	6	7	Schriftl. Prüfung
			T-MACH-112908	Übungen zu TM II	1	0	Studien-leistung
			T-MACH-112905	Technische Mechanik II	6	7	Schriftl. Prüfung
			T-MACH-112909	Übungen zu TM III	1	0	Studien-leistung
			T-MACH-112906	Technische Mechanik III	6	7	Schriftl. Prüfung
	M-MACH-106375 Maschinenkon-struktionslehre (MKL) Matthiesen	20	T-MACH-112981	Workshop zu MKL A	2	0	Studien-leistung
			T-MACH-112984	MKL A	6	8	Schriftl. Prüfung
			T-MACH-112982	Workshop zu MKL B	3	0	Studien-leistung
			T-MACH-112983	Workshop zu MKL C	3	0	Studien-leistung
			T-MACH-112985	MKL B und C	6	12	Schriftl. Prüfung
	M-MACH-106376 Fertigungstechnik und Werk-stoffkunde Pundt	15	T-MACH-112928	Grundlagen der Fertigungs-technik	3	3	Schriftl. Prüfung
			T-MACH-112929	Werkstoffkunde, Praktikum	2	0	Studien-leistung
			T-MACH-112926	Werkstoffkunde I und II	10	12	Mündl. Prüfung
	M-MACH-106388 IT und Data Sci-ence Meyer	7	T-MACH-113408	Pythonkurs zu IT und Data Sci-ence	1	0	Studien-leistung
			T-MACH-113409	Übungen zu IT und Data Sci-ence	1	0	Studien-leistung
			T-MACH-113410	Gruppenarbeit zu IT und Data Science	1	0	Studien-leistung
			T-MACH-112925	IT und Data Science	4	7	Schriftl. Prüfung
	M-MACH-106377 Technische Thermodynamik (TT) Maas	14	T-MACH-112910	Übungen zu TT und Wärme-übertragung I	1	0	Studien-leistung
			T-MACH-112912	TT und Wärmeübertragung I	6	7	Schriftl. Prüfung
			T-MACH-112911	Übungen zu TT und Wärme-übertragung II	1	0	Studien-leistung
			T-MACH-112913	TT und Wärmeübertragung II	6	7	Schriftl. Prüfung
	M-MACH-106380 Elektrotechnik und Mechatronik Fidlin	8	T-ETIT-112934	Grundlagen der Elektrotechnik	4	4	Schriftl. Prüfung
			T-MACH-113008	Übungen zu Grundlagen der Mechatronik	1	0	Studien-leistung
			T-MACH-112937	Grundlagen der Mechatronik	3	4	Schriftl. Prüfung

<table>
<tr><th>Fach</th><th>Modul und deren/ dessen Verant-wortliche(r)</th><th>LP</th><th colspan="2">Teilleistung (TL)</th><th>LP</th><th>Gewich-tung der TL innerhalb des Moduls</th><th>Art der Erfolgs-kon-trolle</th></tr>
<tr><td rowspan="6">Ingenieurwissenschaftliche Grundlagen</td><td>M-MACH-106378
Strömungslehre
Frohnapfel</td><td>7</td><td>T-MACH-112933</td><td>Strömungslehre</td><td>7</td><td>7</td><td>Schriftl. Prüfung</td></tr>
<tr><td>M-MACH-105902
Nachhaltige Pro-duktionswirtschaft
Furmans/ Lanza</td><td>5</td><td>T-MACH-111859</td><td>Nachhaltige Produktionswirt-schaft</td><td>5</td><td>5</td><td>Schriftl. Prüfung</td></tr>
<tr><td>M-MACH-102564
Mess- und Rege-lungstechnik
(MRT)
Stiller</td><td>7</td><td>T-MACH-104745</td><td>Grundlagen der Mess- und Re-gelungstechnik</td><td>7</td><td>7</td><td>Schriftl. Prüfung</td></tr>
<tr><td rowspan="2">M-MACH-106379
Maschinen und Prozesse der Ener-giewandlung
Koch/ Kubach</td><td rowspan="2">7</td><td>T-MACH-112938</td><td>Maschinen und Prozesse der Energiewandlung, Praktikum</td><td>1</td><td>0</td><td>Studien-leistung</td></tr>
<tr><td>T-MACH-112939</td><td>Maschinen und Prozesse der Energiewandlung</td><td>6</td><td>7</td><td>Schriftl. Prüfung</td></tr>
<tr><td>M-MACH-106381
Projekt
Heilmaier</td><td>5</td><td>T-MACH-112940</td><td>Projekt</td><td>5</td><td>0*</td><td>Studien-leistung</td></tr>
<tr><td>Vertiefung im Maschinenbau</td><td>Wahl eines Moduls aus dem Angebot von sechs Fachge-bieten:

M-MACH-106382
Mobilitätssysteme
Gauterin

M-MACH-106383
Computational En-gineering
Böhlke

M-MACH-106384
Intelligente Sys-teme
Stiller

M-MACH-106385
Nachhaltige Ener-gietechnik
Bauer/ Koch

M-MACH-106386
Angewandte Mate-rialien
Greiner

M-MACH-106387
Menschzentrierte Produktentwick-lung und Produk-tion
Schulze/ Matthiesen</td><td>12</td><td colspan="2">Studierende entscheiden sich für ein Fachgebiet (Wahlpflichtmodul) und wählen aus dem Angebot des Fachgebiets insgesamt 12 LP in drei Veranstal-tungen.

Das Angebot der Fachgebiete ist im Modulhandbuch aufgeführt.

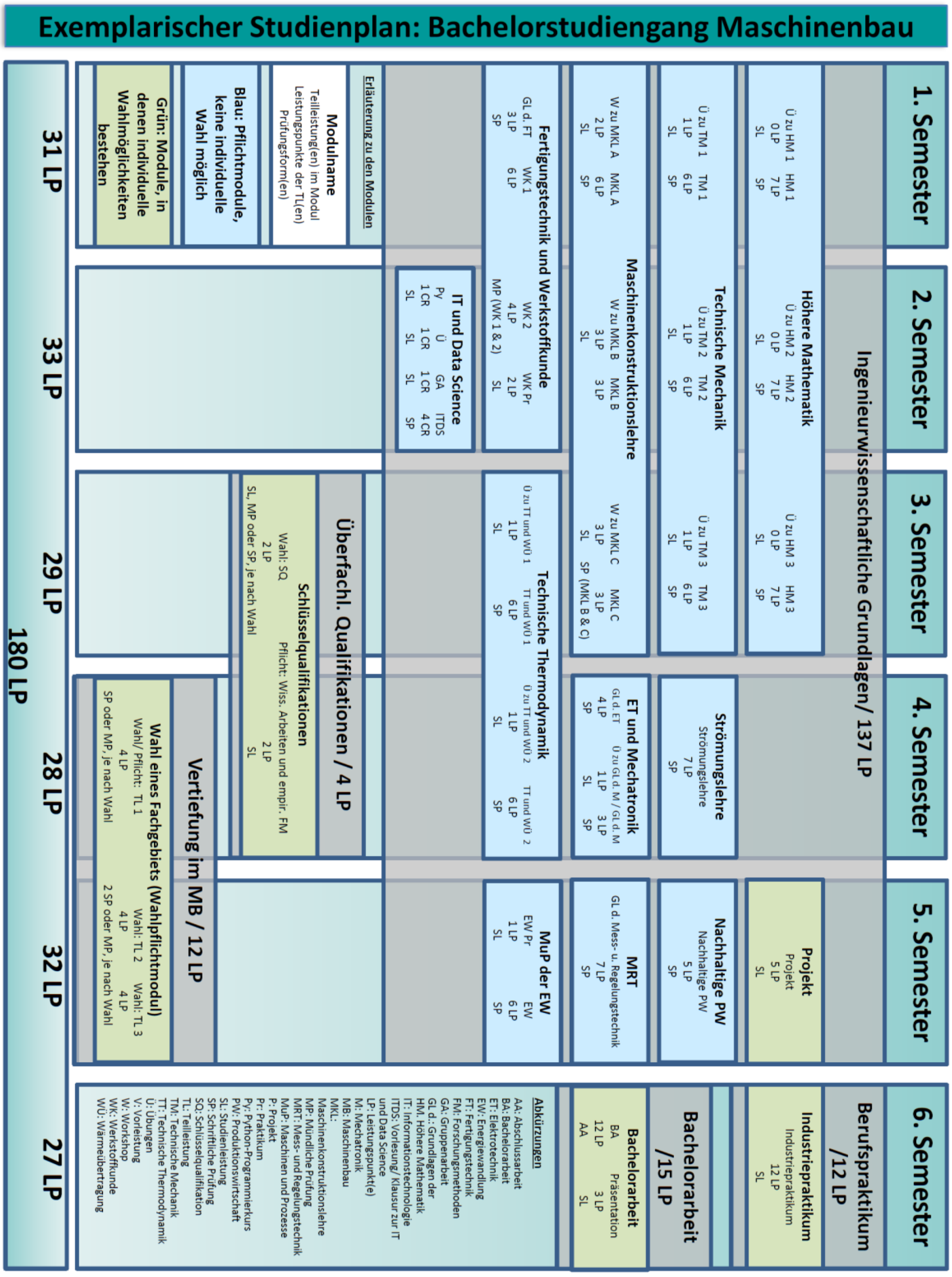
In den Fachgebieten kann eine Pflichtveranstaltung festgelegt werden. Diese wird im Modulhandbuch kenntlich gemacht.</td><td>3 x 4</td><td>Jede der drei Prüfun-gen: 4</td><td>Je nach Wahl</td></tr>
<tr><td rowspan="2">Überfachliche Qualifikationen</td><td rowspan="2">M-MACH-106389
Schlüssel-qualifikationen
Deml</td><td rowspan="2">4</td><td>T-MACH-112930</td><td>Wissenschaftliches Arbeiten und empirische Forschungsme-thoden</td><td>2</td><td>0*</td><td>Studien-leistung</td></tr>
<tr><td colspan="2">Teilnahme an empirischer Forschung oder Angebote von HoC oder Sprachenzentrum sowie ausgewählte Angebote des ZAK, siehe Modulhandbuch</td><td>2</td><td>0*</td><td>Je nach Wahl</td></tr>
</table>

Studienplan für den Bachelorstudiengang Maschinenbau gem. SPO 2023. Gültig ab 01.10.2023,
auf Beschlussfassung des Fakultätsrats vom 28.06.2023, letzte Aktualisierung am 08.03.2024.

Seite 4 von 6

Fach	Modul und deren/ dessen Verant-wortliche(r)	LP	Teilleistung (TL)		LP	Gewich-tung der TL innerhalb des Moduls	Art der Erfolgs-kon-trolle
Berufs-praktikum	M-MACH-106390 Industriepraktikum Heilmaier	12	T-MACH-112941	Industriepraktikum	12	0*	Studien-leistung
Bachelor-arbeit	M-MACH-106422 Bachelorarbeit Heilmaier	15	T-MACH-113045	Bachelorarbeit	12	15**	Ab-schluss-arbeit
			T-MACH-113044	Präsentation	3	0**	Studien-leistung

*Das Modul ist unbenotet.
**Die Note des Moduls Bachelorarbeit wird mit dem doppelten Gewicht der Noten der übrigen Fächer berücksichtigt



Studienplan für den Bachelorstudiengang Maschinenbau gem. SPO 2023. Gültig ab 01.10.2023,
auf Beschlussfassung des Fakultätsrats vom 28.06.2023, letzte Aktualisierung am 08.03.2024.
Seite 5 von 6

3 Erläuterungen zu Modulen mit individuellen Wahlmöglichkeiten

3.1 Schlüsselqualifikationen

Das Modul Schlüsselqualifikationen besteht aus zwei Teilleistungen im Umfang von je 2 LP. Eine der beiden Teilleistungen kann die Teilleistung *Teilnahme an empirischer Forschung* sein. Als Alternative dazu können Studierende auch eine Teilleistung aus den Angeboten des HOC oder des Sprachenzentrums oder aus ausgewählten Veranstaltungen des ZAK besuchen. Eine vollständige Übersicht der wählbaren Teilleistungen findet sich im Modulhandbuch. Die Teilleistung *Wissenschaftliches Arbeiten und empirische Forschungsmethoden* ist eine Pflichtteilleistung im Modul Schlüsselqualifikationen. Sie schließt mit einer Klausur als Studienleistung ab. Entscheiden sich Studierende bei der Wahl-Teilleistung für eine Teilleistung, die mit einer Prüfung abschließt, so geht deren Note nicht in die Abschlussnote mit ein, da das Modul unbenotet ist. Darüber hinaus werden überfachlicher Qualifikationen im Umfang von 2 LP im Fach Ingenieurwissenschaftliche Grundlagen im Modul Projekt vermittelt.

3.2 Vertiefung im Maschinenbau

In der Vertiefung im Maschinenbau stehen sechs verschiedene Fachgebiete zur Auswahl, mit deren Wahl die Studierenden im Bachelorstudiengang einen individuellen Schwerpunkt setzen. Jedes Fachgebiet wird durch ein Modul im Umfang von 12 LP dargestellt.

Modulkennung	Fachgebiet	Fachgebietsverantwortliche(r)
M-MACH-106382	Mobilitätssysteme	Gauterin
M-MACH-106383	Computational Engineering	Böhlke
M-MACH-106384	Intelligente Systeme	Stiller
M-MACH-106385	Nachhaltige Energietechnik	Bauer/ Koch
M-MACH-106386	Angewandte Materialien	Greiner
M-MACH-106387	Menschzentrierte Produktentwicklung und Produktion	Schulze/ Matthiesen

Innerhalb der Fachgebiete belegen die Studierenden drei Veranstaltungen im Umfang von je 4 LP, die Sie aus dem Angebot des Fachgebiets wählen. Von den Fachgebietsverantwortlichen kann maximal eine Pflichtveranstaltung im Umfang von 4 LP festgelegt werden. Diese wird ggf. im Modulhandbuch kenntlich gemacht. Weitere zwei Veranstaltungen im Umfang von je 4 LP sind im Rahmen des Angebots des Fachgebiets von den Studierenden frei wählbar. Das Angebot der Fachgebiete ist im Modulhandbuch aufgeführt. Umfasst die Teilleistung der Prüfung nur 3 LP, setzt aber eine verpflichtende Vorleistung (Studienleistung, 1 LP) voraus, wird die Note der Prüfung innerhalb des Moduls mit 4 LP gewichtet.

3.3 Projekt

In einem Team von 2-5 Personen lösen die Studierenden eine einfache ingenieurwissenschaftliche oder technische Fragestellung aus dem Bereich des Maschinenbaus und angrenzender Fachgebiete. Vor Beginn eines Semesters werden Projekte von den Instituten vorgeschlagen und von den Studierenden gewählt. Das Projekt wird als Teamarbeit während der Vorlesungszeit durchgeführt. Dabei wird das Team von Lehrenden des Instituts angeleitet. Die Ergebnisse der Arbeit werden vom Team präsentiert und dokumentiert. Außerdem erstellen alle Studierenden einzeln eine schriftliche Reflexion über die Arbeit als Team. Das Projekt schließt mit einer Studienleistung im Umfang von 5 LP ab.

3.4 Industriepraktikum

Im Bachelorstudiengang Maschinenbau ist ein mindestens 12-wöchiges Industriepraktikum curricular verankert. Die Anerkennung des Praktikums erfolgt durch das Praktikantenamt der KIT-Fakultät für Maschinenbau. Das Praktikantenamt vermittelt jedoch keine Praktikumsplätze. Die Studierenden müssen sich selbst mit der Bitte um einen geeigneten Praktikumsplatz an einen Betrieb wenden. Das Arbeitsverhältnis wird rechtsverbindlich durch den zwischen dem Betrieb und der Praktikantin bzw. dem Praktikanten abzuschließenden Praktikumsvertrag. Über das Praktikum ist ein Bericht im Umfang von 0,5 Seiten pro Woche anzufertigen. Weitere Informationen zum Praktikum finden sich im Modulhandbuch, auf der Webseite des Praktikantenamts (https://www.mach.kit.edu/praktikantenamt.php) sowie in der Praktikumsordnung (https://www.mach.kit.edu/4295.php). Für das erfolgreiche Absolvieren des Praktikums werden 12 LP vergeben.

3.5 Bachelorarbeit

Das Modul Bachelorarbeit besteht aus einer schriftlichen Ausarbeitung (Bachelorarbeit, 12 LP) sowie einer mündlichen Präsentation (3 LP). Die Präsentation soll spätestens sechs Wochen nach Abgabe der Bachelorarbeit erfolgen. Die Präsentation soll ca. 20 Minuten dauern und wird anschließend mit dem anwesenden Fachpublikum diskutiert.
Die Voraussetzung, Durchführung und Benotung der Bachelorarbeit ist in § 14 der SPO für den Bachelorstudiengang Maschinenbau sowie im Modulhandbuch beschrieben. Die Note des Moduls Bachelorarbeit wird mit dem doppelten Gewicht der Noten der übrigen Fächer berücksichtigt.

6 Field of study structure

Mandatory	
Orientation Exam *This field will not influence the calculated grade of its parent.*	
Bachelor's Thesis	15 CR
Internship *This field will not influence the calculated grade of its parent.*	12 CR
Fundamentals of Engineering	137 CR
Specialization in Mechanical Engineering	12 CR
Interdisciplinary Qualifications *This field will not influence the calculated grade of its parent.*	4 CR
Voluntary	
Additional Examinations *This field will not influence the calculated grade of its parent.*	

6.1 Orientation Exam

Mandatory		
M-MACH-106403	Orientation Exam	0 CR

6.2 Bachelor's Thesis

Credits
15

Mandatory		
M-MACH-106422	Bachelor's Thesis	15 CR

6.3 Internship

Credits
12

Mandatory		
M-MACH-106390	Industrial Internship	12 CR

6.4 Fundamentals of Engineering

Credits
137

Mandatory		
M-MACH-106380	Electrical Engineering and Mechatronics	8 CR
M-MACH-106376	Manufacturing Technology and Materials Science	15 CR
M-MATH-102859	Advanced Mathematics	21 CR
M-MACH-106388	IT and Data Science	7 CR
M-MACH-106375	Mechanical Design	20 CR
M-MACH-106379	Machines and Processes of Energy Conversion	7 CR
M-MACH-102564	Measurement and Control Systems	7 CR
M-MACH-105902	Sustainable Production Economics	5 CR
M-MACH-106381	Project	5 CR
M-MACH-106378	Fluid Mechanics	7 CR
M-MACH-106374	Engineering Mechanics	21 CR
M-MACH-106377	Technical Thermodynamics	14 CR

6.5 Specialization in Mechanical Engineering

Credits
12

Specialization (Election: 1 item)		
M-MACH-106386	Applied Materials	12 CR
M-MACH-106383	Computational Engineering	12 CR
M-MACH-106384	Intelligent Systems	12 CR
M-MACH-106387	Human-Centered Product Development and Production	12 CR
M-MACH-106382	Mobility Systems	12 CR
M-MACH-106385	Sustainable Energy Technology	12 CR

6.6 Interdisciplinary Qualifications

Credits
4

Mandatory		
M-MACH-106389	Key Competences	4 CR

6.7 Additional Examinations

Additional Examinations (Election: at most 30 credits)		
M-ZAK-106099	Supplementary Studies on Sustainable Development	19 CR
M-ZAK-106235	Supplementary Studies on Culture and Society	22 CR

7 Modules

M 7.1 Module: Advanced Mathematics [M-MATH-102859]

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

Credits	Grading scale	Duration	Language	Level	Version
21	Grade to a tenth	3 terms	German	1	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.

Prerequisites
None.

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.

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

Workload
In class: 270 hours

- lectures, tutorials and examinations

Independent study: 360 hours

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

Learning type
Lecture, problem classes, tutorials

M 7.2 Module: Applied Materials [M-MACH-106386]

Responsible: Prof. Dr. Christian Greiner
Organisation: KIT Department of Mechanical Engineering
Part of: Specialization in Mechanical Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each summer term	2 terms	German	2	1

Applied Materials (Election: 12 credits)			
T-MACH-112974	Additive Manufacturing: Development and Manufacturing of Metallic Components	4 CR	Schulze, Zanger
T-MACH-112976	Introduction to Mechanics of Fibre-Reinforced Composites	4 CR	Kärger, Wittemann
T-MACH-113011	Functional Materials	4 CR	Gruber
T-MACH-110377	Continuum Mechanics of Solids and Fluids	3 CR	Böhlke, Frohnapfel
T-MACH-110333	Tutorial Continuum Mechanics of Solids and Fluids *This item will not influence the grade calculation of this parent.*	1 CR	Böhlke, Frohnapfel
T-MACH-105303	Modelling of Microstructures	4 CR	August, Nestler
T-MACH-112979	Surface Technology	4 CR	Schneider
T-MACH-112980	Physical Foundation of Modern Measurement Methods	4 CR	Dienwiebel, Weygand
T-MACH-100531	Systematic Materials Selection	4 CR	Dietrich, Schulze
T-MACH-112978	Material and Contact Mechanics	4 CR	Greiner
T-MACH-111258	Introduction to High Temperature Materials	4 CR	Gorr
T-MACH-112986	Materials Processing Technology	4 CR	Binder, Liebig

Competence Certificate
see individual courses

Prerequisites
none

Competence Goal
By choosing this specialization, students receive foundational skills in all engineering-related material classes as well as materials mechanics. This applies above all to metals, ceramics and polymers as well as material composites. It begins with the selection of a suitable material and its targeted processing, which defines tailor-made properties. In addition, skills in the simulation of material microstructures and properties are taught. Such competences are essential in order to address societal issues - climate change, circular economy, resource efficiency - by means of mechanical engineering approaches using suitable, modern materials.

Content
The modul consists of material selection, processing, material as well as fluid dynamics simulations, mechanics of materials and surfaces, surface engineering, modern methods of material characterization and measurement, ceramic materials for functional as well as for structural applications, high temperature alloys and additive manufactoring.

Module grade calculation
Average of graded exams (with equal weight).

Workload
360 hours, of which 135 - 180 hours of attendance time, depending on the choice of courses

Learning type
lectures/ tutorials, depending on the choice of courses

Literature
see individual courses

M 7.3 Module: Bachelor's Thesis [M-MACH-106422]

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

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
15	Grade to a tenth	Each term	1 term	German	3	1

Mandatory			
T-MACH-113045	Bachelor's Thesis	12 CR	Heilmaier
T-MACH-113044	Presentation	3 CR	Heilmaier

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

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

Modeled Conditions
The following conditions have to be fulfilled:

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

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.

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

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

M 7.4 Module: Computational Engineering [M-MACH-106383]

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

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each summer term	2 terms	German	2	1

Mandatory			
T-MACH-112987	Computational Continuum Mechanics	3 CR	Böhlke
T-MACH-112996	Tutorial Computational Continuum Mechanics *This item will not influence the grade calculation of this parent.*	1 CR	Böhlke
Computational Engineering (Election: 8 credits)			
T-MACH-112717	Dimensioning of Additive-Manufactured Polymer Structures at an Example from Medical Engineering	4 CR	Kärger
T-MACH-105320	Introduction to the Finite Element Method	3 CR	Böhlke, Langhoff
T-MACH-110330	Tutorial Introduction to the Finite Element Method *This item will not influence the grade calculation of this parent.*	1 CR	Böhlke, Langhoff
T-MACH-112976	Introduction to Mechanics of Fibre-Reinforced Composites	4 CR	Kärger, Wittemann
T-MACH-110362	Introduction to Computational Fluid Dynamics	3 CR	Frohnapfel, Stroh
T-MACH-111033	Tutorial Introduction to Computational Fluid Dynamics *This item will not influence the grade calculation of this parent.*	1 CR	Frohnapfel, Stroh
T-MACH-105514	Experimental Dynamics	4 CR	Fidlin
T-MACH-113006	Basics of Computational Dynamics	4 CR	Proppe
T-MACH-110377	Continuum Mechanics of Solids and Fluids	3 CR	Böhlke, Frohnapfel
T-MACH-110333	Tutorial Continuum Mechanics of Solids and Fluids *This item will not influence the grade calculation of this parent.*	1 CR	Böhlke, Frohnapfel
T-MACH-105349	Computational Dynamics	4 CR	Proppe
T-MACH-105290	Vibration Theory	4 CR	Fidlin

Competence Certificate
See individual courses

Prerequisites
none

Competence Goal
After completion of this module, the students can

- state essential concepts and models of continuum (thermo)mechanics in the context of given problems,
- transfer the basic equations of the given problem into an algorithm for a computational solution in order to generate simulation-based results afterwards,
- classify the basic computational tools depending on the concrete problem class and apply them to concrete tasks,
- evaluate, visualize, critically discuss and question the achieved solution of a given problem and, if necessary, validate it experimentally,
- state the basic principles for sustainable research data management.

Content
The overall theme of the subject area is the knowledge of the fundamentals of computational methods in the engineering field of mechanical engineering. In the compulsory area, the fundamentals of computational continuum mechanics are laid. In the supplementary area, students can then individually deepen methods from different disciplines according to their interests.

Module grade calculation
Average of graded exams (with equal weight).

Workload
360 hours, of which 135 - 180 hours of attendance time, depending on the choice of courses

Learning type
lectures/ tutorials, depending on the choice of courses

Literature
see individual courses

M 7.5 Module: Electrical Engineering and Mechatronics [M-MACH-106380]

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

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
8	Grade to a tenth	Each summer term	1 term	German	2	1

Mandatory			
T-ETIT-112934	Basics of Electrical Engineering	4 CR	Brodatzki, Doppelbauer
T-MACH-113008	Tutorial Basics of Mechatronics *This item will not influence the grade calculation of this parent.*	1 CR	Fidlin
T-MACH-112937	Basics of Mechatronics	3 CR	Fidlin

Competence Certificate
see individual courses

Prerequisites
none

Competence Goal
Students will be able to describe the dynamic behavior of electromechanical systems in a uniform mathematical way. They can analyze the interactions between mechanical and electromagnetic subsystems. They know the essential feedback effects, can recognize them and calculate their effects. Students have an overview of simple electro-, magneto-mechanical and piezoelectric transducers and their applications in sensor and actuator operation. They can analyze dynamic behavior of simple mechatronic systems (including simple control) in terms of steady-state operation and stability.

Students have gained an overview of electrical engineering fundamentals (electric field, magnetic field) and basic elements of electrical networks (resistor, capacitor, coil). They know the synthetic methods for calculating direct and alternating current electrical circuits. The students have an overview of the most important semiconductor components and their mode of operation and understand elementary basic power electronic circuits. They know the structure and the steady-state operating behavior of the most important electrical machines.

Content

- Variation principles and general formulation of physical laws
- Electro-mechanical transducers and the equations of Lagrange-Maxwell
- Capacitive transducers, inductive transducers, piezo-electric transducers
- Elementary methods of dynamic analysis: rest positions, stability, singular perturbed systems
- Dynamics of coupled electro-mechanical systems
- Capacitive and inductive sensors, magnetic suspension, oscillating un-exciters, piezo-sensors and -actuators
- Basic concepts, electric field, magnetic field, magnetic materials, transition to concentrated parameters
- Basic elements: ohmic resistance, capacitor, coil, linear networks
- Complex alternating current calculation, power terms, three-phase current
- transformer, synchronous machine, asynchronous machine
- Semiconductor devices, diodes, transistors, MOSFET and IGBT, power electronics, modulation

Module grade calculation
The module grade is computed as an average of the grades of the two written exams (50% each).

Workload
240 hours of which 90 hours presence during lectures/ tutorials, and 150 hours self-study time

Learning type
Lecture, tutorials

M 7.6 Module: Engineering Mechanics [M-MACH-106374]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Prof. Dr.-Ing. Carsten Proppe

Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
21	Grade to a tenth	Each winter term	3 terms	German	1	1

Mandatory			
T-MACH-112904	Engineering Mechanics I	6 CR	Böhlke, Langhoff
T-MACH-112907	Tutorial Engineering Mechanics I *This item will not influence the grade calculation of this parent.*	1 CR	Böhlke, Langhoff
T-MACH-112905	Engineering Mechanics II	6 CR	Böhlke, Langhoff
T-MACH-112908	Tutorial Engineering Mechanics II *This item will not influence the grade calculation of this parent.*	1 CR	Böhlke, Langhoff
T-MACH-112906	Engineering Mechanics III	6 CR	N.N., Proppe
T-MACH-112909	Tutorial Engineering Mechanics III *This item will not influence the grade calculation of this parent.*	1 CR	N.N., Proppe

Competence Certificate
Engineering Mechanics I (T-MACH-112904): written exam, 90 minutes, graded. Additives as announced

Engineering Mechanics II (T-MACH-112905): written exam, 90 minutes, graded. Additives as announced

Engineering Mechanics III (T-MACH-112906): written exam, 180 minutes, graded. Additives as announced

Coursework in *Tutorial Engineering Mechanics I* (T-MACH-112907) must be passed for admission to the exam Engineering Mechanics I.

Coursework in *Tutorial Engineering Mechanics II* (T-MACH-112908) must be passed for admission to the exam Engineering Mechanics II.

Coursework in *Tutorial Engineering Mechanics III* (T-MACH-112909) must be passed for admission to the exam Engineering Mechanics III.

Prerequisites
none

Competence Goal
After completion of this module the students can

- compute internal forces and moments for linear structures
- compute and evaluate 3D stress and strain states within the framework of linear elasticity and thermoelasticity
- apply the principle of virtual displacements
- apply energy methods and evaluate approximate solutions
- evaluate the stability of equilibrium positions

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 interpret 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.

Content
Contents of "Engineering Mechanics I"

- basics of vector calculus; force systems
- statics of rigid bodies
- internal forces and moments in bars and beam
- friction
- center of gravity, center of mass
- work, energy, principle of virtual work
- statics of undeformable ropes
- elastostatics of tension-compression-bars

Contents of "Engineering Mechanics II"

- bending
- shear
- torsion
- stress and strain state in 3D
- Hooke's law in 3D
- elasticity theory in 3D
- energy methods in elastostatics
- approximation methods
- stability

Contents of "Engineering Mechanics III"

- Kinematics of mass points
- Kinematics of continua
- Guided motion
- Mass kinematic quantities
- Dynamic quantities
- Dynamic axioms and theorems
- Analytical methods
- Impacts
- Vibrations
- Gyroscopes

Module grade calculation
The module grade is calculated from the CP-weighted average of the graded partial exams.

Workload
155 hours regular attendance, 475 hours self-study

Learning type
Lectures, Tutorials, Lab course groups, attestation of solved work sheets, consultation hours

M 7.7 Module: Fluid Mechanics [M-MACH-106378]

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

Part of: Fundamentals of Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
7	Grade to a tenth	Each summer term	1 term	German	2	1

Mandatory			
T-MACH-112933	Fluid Mechanics	7 CR	Frohnapfel

Competence Certificate
Written exam

Prerequisites
none

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

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

Module grade calculation
result of exam

Workload
In presence: 90 hours
Self study time: 120 hours

Recommendation
none

Learning type
Lectures + tutorials

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

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

7.8 Module: Human-Centered Product Development and Production [M-MACH-106387]

Responsible: Prof. Dr.-Ing. Sven Matthiesen
Prof. Dr.-Ing. Volker Schulze
Organisation: KIT Department of Mechanical Engineering
Part of: Specialization in Mechanical Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each summer term	2 terms	German	2	1

Human-Centered Product Development and Production (Election: at most 3 items as well as at least 12 credits)			
T-MACH-112974	Additive Manufacturing: Development and Manufacturing of Metallic Components	4 CR	Schulze, Zanger
T-MACH-105233	Powertrain Systems Technology A: Automotive Systems	4 CR	Albers, Matthiesen, Ott
T-MACH-105518	Human Factors Engineering I	4 CR	Deml
T-MACH-112717	Dimensioning of Additive-Manufactured Polymer Structures at an Example from Medical Engineering	4 CR	Kärger
T-MACH-112971	Basics of Production Automation	4 CR	Fleischer
T-MACH-112970	Artificial Intelligence in Production	4 CR	Fleischer
T-MACH-112968	Material Flow in Production and Logistics	4 CR	Furmans
T-MACH-112988	Mechatronical Systems and Products	4 CR	Hohmann, Matthiesen
T-MACH-112969	Production Technology for E-Mobility	4 CR	Fleischer
T-MACH-112995	Production Techniques Laboratory	4 CR	Deml, Fleischer, Furmans, Ovtcharova
T-MACH-112972	Smart Factory	4 CR	Lanza
T-MACH-112973	Cutting: Development and Manufacturing of Metallic Components	4 CR	Schulze

Competence Certificate
see individual courses

Prerequisites
none

Module grade calculation
Average of graded exams (with equal weight).

Workload
360 hours, of which 135 - 180 hours of attendance time, depending on the choice of courses

Learning type
lectures/ tutorials, depending on the choice of courses

Literature
see individual courses

M 7.9 Module: Industrial Internship [M-MACH-106390]

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

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

Mandatory			
T-MACH-112941	Industrial Internship	12 CR	Heilmaier

Competence Certificate
See chosen brick course

Prerequisites
none

Competence Goal
After their internship, the students will be able to

- describe the principles of organisational structure and process organization (e.g. production plannung and control) in an industrial company,
- perform complex technical tasks under realistic conditions,
- apply key qualifications such as personal initiative, teamwork and communication skills in addition to their technical practical experience and skills and
- describe the subject-related and interdisciplinary requirements in the individually aspired later field of activity and can take this into account for further studies.

Content
In order to ensure a sufficient breadth of the practical work experience, activities from at least two different fields of work must be selected. The activities in the professional internship must correspond to the occupational profile of engineering in terms of content. The activities can be chosen from the following areas:

- (industrial) research and development,
- design and process planning,
- production planning and control,
- logistics and operations management,
- modelling and simulation,
- design of experiments, experimental procedure and evaluation,
- project and planning tasks,
- engineering services and
- other subject-related complex activities (projects) according to the chosen specialisation.

Module grade calculation
Certification without grade.

Annotation
As part of the bachelor's program, a professional internship must be completed in accordance with SPO § 14a. The prescribed minimum duration is 12 weeks full-time. Missed work time must be made up in any case. In case of absences, the intern must ask the company for an extension of the contract in order to be able to carry out the professional internship to the required extent.
The Internship Office does not arrange internships. Students must contact a company themselves with a request for a suitable internship. The contract of employment becomes legally binding through the internship contract to be concluded between the company and the intern. The contract defines all rights and obligations of the intern and the company as well as the type and duration of the internship. Company here stands synonymously for engineering offices, companies etc. However, the professional internship cannot have been carried out at universities, equivalent institutions of higher education or in comparable research institutions.

Workload
Time of attendance in the company including preparation of the internship report: 12 weeks x 35 hours/week = 420 hours

Learning type
Professional internship

7.10 Module: Intelligent Systems [M-MACH-106384]

Responsible: Prof. Dr.-Ing. Anne Meyer
Prof. Dr.-Ing. Christoph Stiller

Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each summer term	2 terms	German	2	1

Intelligent Systems (Election: between 2 and 3 items as well as between 8 and 12 credits)			
T-MACH-113010	Automation and Autonomy in Logistics	4 CR	Furmans
T-MACH-112971	Basics of Production Automation	4 CR	Fleischer
T-MACH-112970	Artificial Intelligence in Production	4 CR	Fleischer
T-MACH-112988	Mechatronical Systems and Products	4 CR	Hohmann, Matthiesen
T-MACH-105335	Measurement II	4 CR	Stiller
T-MACH-112972	Smart Factory	4 CR	Lanza
Intelligent Systems - Practicals (Election: at most 1 item as well as at most 4 credits)			
T-MACH-105341	Lab Computer-Aided Methods for Measurement and Control	4 CR	Klemp, Stiller

Competence Certificate
see individual courses

Prerequisites
none

Competence Goal
Students understand the chain of action of the perception-action loop and can present essential requirements and an exemplary realization for selected applications.

Students know selected methods of machine perception and action planning and can illustrate the strengths and weaknesses of these methods using examples. They are proficient in both classical methods based on probabilistic models and AI methods and can combine them in a targeted manner.

Students have implementation competence and have gained their own experience and expertise on examples of intelligent systems from their own experimentation, for example in laboratory practicals, or from self-implemented simulation.

Content
This specialization should be selected by students of mechanical engineering and related subjects who wish to acquire interdisciplinary knowledge in this field. In addition to lectures, exercises and tutorials, laboratory practicals are offered for selection to achieve practical implementation competence.

Machine intelligence opens up novel capabilities to machines and increasingly defines the utility and customer satisfaction of machines. The field of "Intelligent Systems" considers the so-called perception-action loop, i.e. the chain of action from the sensory perception of the environment to the understanding of the situation picture to behavior planning and its control with the help of actuators. The specialization includes application fields of intelligent systems as well as mathematical models and methods for the realization of the perception-action loop.

In addition to established methods, such as perception using probabilistic models and rule-based planning, data-driven artificial intelligence (AI) approaches, such as deep neural networks, are increasingly being used. These often show a higher performance in wide fields of application compared to established methods. Often, the architecture of the neural network is based on the mode of action of corresponding probabilistic or rule-based methods, so that knowledge from both domains is advantageous. In addition, AI approaches generally have a black box character, i.e. it is difficult or impossible to guarantee certain behavioral properties. Therefore, combinations of AI methods with established procedures are often used in safety-critical applications.

Module grade calculation
Average of graded exams (with equal weight).

Workload
360 hours, of which 135 - 180 hours of attendance time, depending on the choice of courses

Learning type
lectures/ tutorials/ practical, depending on the choice of courses

Literature
see individual courses

M 7.11 Module: IT and Data Science [M-MACH-106388]

Responsible: Prof. Dr.-Ing. Anne Meyer
Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
7	Grade to a tenth	Each summer term	1 term	German	1	2

Mandatory			
T-MACH-112925	IT and Data Science	4 CR	Meyer
T-MACH-113408	Python course on IT and Data Science	1 CR	Meyer
T-MACH-113409	Tutorial IT and Data Science	1 CR	Meyer
T-MACH-113410	Group work IT and Data Science	1 CR	Meyer

Competence Certificate
see individual courses

Prerequisites
Before registration for the exam, the prerequisite has to be passed.

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

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

Module grade calculation
Result of written exam

Workload
210 hours, of which

- on campus (presence) 90 hours
- self study time 120 hours

Learning type
Lecture and Lab Course

M 7.12 Module: Key Competences [M-MACH-106389]

Responsible: Prof. Dr.-Ing. Barbara Deml
Organisation: KIT Department of Mechanical Engineering

Part of: Interdisciplinary Qualifications

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

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

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

Mandatory			
T-MACH-112930	Scientific Work and Empirical Research Methods	2 CR	Deml
Key Competences (Election: 2 credits)			
T-ZAK-113104	Improving Your Speech. Convincing by Personality	2 CR	
T-ZAK-113076	Teamwork - Understanding Teams and Working Together Successfully!	2 CR	
T-MACH-112935	Participation in Empirical Research	2 CR	Deml
T-MACH-112931	Self-Booking-BSc-HOC-SPZ-Graded	2 CR	Deml
T-MACH-112936	Self-Booking-BSc-HOC-SPZ-Non-Graded	2 CR	Deml

Competence Certificate
see individual courses

Prerequisites
see individual courses

Competence Goal
The students are able to write a scientific qualification paper, such as a Bachelor's thesis, in a formally correct way. They can research scientific literature, professionally evaluate the quality of a literature reference and present specialised information in a clear and convincingly argued manner. They know methods to obtain data scientifically and to evaluate it with the help of suitable statistical procedures. The students are also able to apply these methods to questions from mechanical engineering. Furthermore, after completing the module they are better able to cope with supra-disciplinary and supra-professional requirement situations.

Content
The module imparts knowledge and skills that can be used for a relatively long period of time in order to cope with demanding professional situations. It addresses both the competence fields of professional competence (scientific work) and methodological competence (empirical research methods), as well as social and individual competence. In the latter area, students can choose from a catalogue of subjects so that, among other things, social-cultural or creative-communicative content can be integrated into the programme.

Module grade calculation
The module is not graded.

Workload
A total of 120 time hours.

The division into attendance and self-study time depends on the individual choice of courses. The following applies to all courses: One SWS corresponds to 15 hours of attendance time. The remaining time is spent in self-study.

Learning type
Lectures, tutorials, practical work, depending on choice of courses

Literature
Depending on choice of courses; will be announced in course if applicable

M 7.13 Module: Machines and Processes of Energy Conversion [M-MACH-106379]

Responsible: Prof. Dr.-Ing. Hans-Jörg Bauer
Prof. Dr. Thomas Koch
Dr.-Ing. Heiko Kubach
Dr. Balazs Pritz

Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
7	Grade to a tenth	Each winter term	1 term	German	3	1

Mandatory			
T-MACH-112938	Machines and Processes of Energy Conversion, Lab Course *This item will not influence the grade calculation of this parent.*	1 CR	Koch, Kubach
T-MACH-112939	Machines and Processes of Energy Conversion	6 CR	Koch, Kubach

Competence Certificate
see individual courses

Prerequisites
none

Competence Goal
Students can name and describe the basic energy conversion processes and executed energy converting machines. They can explain the application of the energy conversion processes in different machines. They can draw up energy balances for the various energy conversion processes. They can analyze and evaluate the processes and machines with regard to functionality and efficiency and solve simple technical problems concerning the operation of the machines.

Content

- Introduction to power engineering
- Radial and axial turbines
- Pumps
- Compressors
- Blowers
- Wind turbines
- Fuel cells
- Energy storage
- E-motors
- Heat pumps
- Combined heat and power
- Diesel engines
- Gasoline engines
- Hydrogen engines

Module grade calculation
The module grade corresponds to the grade of the written exam.

Workload
210 h, 54 of which in presence

Learning type
Lecture with tutorial and lab course

M 7.14 Module: Manufacturing Technology and Materials Science [M-MACH-106376]

Responsible: Prof. Dr. Astrid Pundt
Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
15	Grade to a tenth	Each winter term	2 terms	German	1	1

Mandatory			
T-MACH-112928	Basics of Manufacturing Technology	3 CR	Schulze
T-MACH-112926	Materials Science I and II	10 CR	Heilmaier, Pundt
T-MACH-112929	Materials Science Lab Course	2 CR	Pundt, Wagner

Competence Certificate
see individual courses

Prerequisites
keine

Competence Goal
Within this Module the students should

WK I/II

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

Basics of Manufacturing Technology

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 product

Content
WK I

- Structure of atoms and atomic bonding
- Crystalline solids
- Defects in crystalline solids
- Amorphous and partially crystalline solids
- Constitution of alloys and materials
- Diffusion and phase transformation in the solid state
- Microscopic characterization method
- Characterization with X-Rays and neutrons
- Non-destructive Testing
- Mechanical Testing

WK II

- Iron based alloys
- Non-iron based alloys
- Ceramics
- Glases
- Polymers
- Composite Materials

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.

Basics of Manufacturing Technology

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

Module grade calculation
The module grade is computed from the two graded courses and weighted by their credit points, including credit points of respective prerequisite.

The grade earned in the exam corresponding to T-MACH-112928 is thus weighted by a factor of 3, while the grade earned in the exam corresponding to T-MACH-112926 is weighted by a factor of 12.

Workload
T-MACH-112926: In presence: 90 hours; Self study time: 210 hours

T-MACH-112928: In presence: 30 hours; Self study time: 60 hours

T-MACH-112929: In presence: 25 hours; Self study time: 35 hours

Learning type
T-MACH-112926: lectures and tutorials

T-MACH-112928: lectures and tutorials

T-MACH-112929: lab course

M 7.15 Module: Measurement and Control Systems (BSc-Modul 11, MRT) [M-MACH-102564]

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

Part of: Fundamentals of Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
7	Grade to a tenth	Each winter term	1 term	German/English	3	2

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

Competence Certificate
Type of Examination: written exam

Duration of Examination: 150 minutes

Prerequisites
none

Competence Goal

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

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

Module grade calculation
result of exam

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

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

Workload
84 hours presence time, 126 hours selfstudies

Recommendation
Fundamentals in physics and electrical engineering, ordinary linear diffential epuations, Laplace transform

Learning type
Lecture

Tutorials

Literature
Buch zur Vorlesung:
C. Stiller: Grundlagen der Mess- und Regelungstechnik, Shaker Verlag, Aachen, 2005

- Measurement and Control Systems:

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

- Regelungstechnische Bücher:

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

- Messtechnische Bücher:

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

Measurement and Control Systems

M 7.16 Module: Mechanical Design [M-MACH-106375]

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

Part of: Fundamentals of Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
20	Grade to a tenth	Each winter term	3 terms	German	1	1

Mandatory			
T-MACH-112981	Mechanical Design A, Workshop	2 CR	Matthiesen
T-MACH-112984	Mechanical Design A	6 CR	Matthiesen
T-MACH-112982	Mechanical Design B, Workshop	3 CR	Matthiesen
T-MACH-112983	Mechanical Design C, Workshop	3 CR	Matthiesen
T-MACH-112985	Mechanical Design B and C	6 CR	Matthiesen

Competence Certificate
see individual courses

Prerequisites
None

Competence Goal
In mechanical design, students acquire skills in analysis and synthesis using examples. These include both individual machine elements such as bearings or springs and more complicated systems such as gears or couplings. After completing the machine design theory, the students are able to apply the contents learned to other technical systems - even those not known from the lecture - by transferring the principles of action and basic functions learned from examples to other contexts. This enables students to independently analyze unknown technical systems and synthesize suitable systems for given problems.

Content
MD A

- Springs
- Technical Systems
- Bearings
- Sealings
- Component Joints
- Gears

MD B

- Design
- Tolerances & Fittings
- Gear Transmission
- Clutches

MD C

- Bolt connections
- Dimensioning
- Electric Motors + Hydraulics

Module grade calculation
The module grade is computred from the two graded exams, and is weighted according to their credit points, including credit points of respective prerequisite(s).

Thus, the exam grade corresponding to T-MACH-112984 - Mechanical Design A receives a weight of a factor of 8, while the exam grade T-MACH-112985 - Mechanical Design B and C receives a weight of a factor of 12.

Annotation
None

Workload

MKL A: Total workload: 240 h, thereof attendance 75 h, divided into lecture + exercise: 4 SWS -> 60 h as well as workshop: 1 SWS -> 15; self-study 165 h

MKL B: Total workload: 180 h, thereof attendance: 67.5 h, divided into lecture + tutorial: 3 SWS -> 45 h and workshop: 1.5 SWS -> 22.5; self-study 112.5 h

MKL C: Total workload: 180 h, of which attendance: 67.5 h, divided into lecture + exercise: 3 SWS -> 45 h as well as workshop: 1.5 SWS -> 22.5; self-study 112.5 h

Recommendation

None

Learning type

Lectures, exercises and semester-long workshops as well as project work

Literature

Grundlagen der Berechnung und Gestaltung von Maschinenelementen; Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X oder Volltextzugriff über Uni-Katalog der Universitätsbibliothek

Grundlagen von Maschinenelementen für Antriebsaufgaben; Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

Base for

None

M 7.17 Module: Mobility Systems [M-MACH-106382]

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

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each summer term	2 terms	German	2	1

Mandatory			
T-MACH-112992	Vehicles in Mobility Systems	4 CR	Cichon, Gauterin, Geimer
Mobility Systems (Election: 8 credits)			
T-MACH-105233	Powertrain Systems Technology A: Automotive Systems	4 CR	Albers, Matthiesen, Ott
T-MACH-105226	Dynamics of the Automotive Drive Train	4 CR	Fidlin
T-MACH-105320	Introduction to the Finite Element Method	3 CR	Böhlke, Langhoff
T-MACH-110330	Tutorial Introduction to the Finite Element Method	1 CR	Böhlke, Langhoff
T-MACH-112976	Introduction to Mechanics of Fibre-Reinforced Composites	4 CR	Kärger, Wittemann
T-MACH-110362	Introduction to Computational Fluid Dynamics	3 CR	Frohnapfel, Stroh
T-MACH-111033	Tutorial Introduction to Computational Fluid Dynamics	1 CR	Frohnapfel, Stroh
T-MACH-108374	Vehicle Ergonomics	4 CR	Ehrhardt
T-MACH-112971	Basics of Production Automation	4 CR	Fleischer
T-MACH-113013	Basics of Technical Logistics	4 CR	Mittwollen, Oellerich
T-ETIT-100784	Hybrid and Electric Vehicles	4 CR	Doppelbauer
T-MACH-111578	Sustainable Vehicle Drivetrains	4 CR	Koch, Toedter
T-MACH-112979	Surface Technology	4 CR	Schneider
T-MACH-112969	Production Technology for E-Mobility	4 CR	Fleischer
T-MACH-102155	Product, Process and Resource Integration in the Automotive Industry	4 CR	Mbang
T-MACH-105350	Computational Vehicle Dynamics	4 CR	Proppe
T-MACH-112972	Smart Factory	4 CR	Lanza
T-MACH-113005	Fundamentals of Combustion Engine Technology	4 CR	Bernhardt, Kubach, Pfeil, Toedter, Wagner
T-MACH-105290	Vibration Theory	4 CR	Fidlin
T-BGU-113007	Transportation Systems	4 CR	Vortisch

Competence Certificate
See individual courses.

Prerequisites
None.

Competence Goal
The students have a basic understanding of the various mobility systems and their specifics and can assess the possible applications and effects in practice. They apply basic methods in the areas of conception, calculation and development. The students can plan and design vehicle systems from an engineering perspective and assess aspects of the interaction between people and technology as well as production.

Content
The Mobility Systems subject area teaches the fundamentals that are significant for the development, design, production and operation of vehicle systems. The essential technical solutions that make operation safe, comfortable and sustainable are considered.
In the subject area of mobility systems, the focus is on road and rail vehicles as well as mobile machines, taking into account future mobility systems.

Further information: See brick courses.

Module grade calculation
Average of graded exams (with equal weight).

Workload
360 hours, of which 135 - 180 hours of attendance time, depending on the choice of courses.

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

M 7.18 Module: Orientation Exam [M-MACH-106403]

Organisation: University
Part of: Orientation Exam

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
0	pass/fail	Each term	2 terms	German	3	1

Mandatory			
T-MATH-100275	Advanced Mathematics I	7 CR	Arens, Griesmaier, Hettlich
T-MACH-112904	Engineering Mechanics I	6 CR	Böhlke, Langhoff

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

M 7.19 Module: Project [M-MACH-106381]

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

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

Mandatory			
T-MACH-112940	Project	5 CR	Heilmaier

Competence Certificate
see course

Prerequisites
none, but see recommendations

Competence Goal
Students are able to work in teams to analyze simple engineering or technical engineering or technical problems from the field of mechanical engineering and related disciplines. They are able to find one or more solutions for the problem, to compare, discuss and evaluate different solutions if necessary, and finally to pursue a solution and work it out. In doing so, they apply engineering methods for problem solving as well as methods for developing technical solutions. They incorporate the previously defined requirements and development goals and define indicators to verify the achievement of the goals.

Students are able to define and plan individual work steps from the task definition. They are able to communicate their own results in a team, discuss them professionally and sufficiently document the results of the discussion. In addition, they can record and analyze the work results of team members and derive a common solution. In doing so, they apply the knowledge they have acquired in their studies in time, conflict and project management and gain practical experience in these areas.

Students are able to independently research relevant, current scientific and technical literature in a structured manner and to include this in their solution. The students are able to document their technical results, whereby they orientate themselves on the statutes for the safeguarding of good scientific practice at KIT and pay particular attention to scientific language expression and citation rules. Furthermore, they are able to reflect in writing on their work as a team and to critically analyze their experiences. The students are able to present their project results and put them up for discussion.

Content

- Students solve a simple engineering or technical problem from the field of mechanical engineering and related disciplines, in a team of 2-5 students.
- Application of time, conflict and project management
- Research of technical and scientific literature
- Presentation of the results (as team)
- Documentation of the results (as team)
- Preparation of a written reflection on their work as a team (individual)

Module grade calculation
The module is ungraded.

Workload
150 hours, including at least three meetings with supervisor. Additional attendance hours as required and assessed by the project team.

Recommendation
Successful completion of the course *Scientific Work and Empirical Research Methods* (Interdisciplinary Qualifications).

Learning type
Project work in a team of 2-5 students, at least three meetings with the supervisor.

Base for
Some skills acquired during the project work (literature research, writing a project report) is required in the Bachelor's thesis.

M 7.20 Module: Supplementary Studies on Culture and Society [M-ZAK-106235]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: Additional Examinations

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
22	Grade to a tenth	Each term	3 terms	German	3	1

Election notes

With the exception of the final oral exam and the practice module, students have to self-record the achievements obtained in the Supplementary Studies on Culture and Society in their study plan. ZAK records the achievements as "non-assigned" under "ÜQ/SQ-Leistungen". Further instructions on self-recording of achievements can be found in the FAQ at https://campus.studium.kit.edu/ and on the ZAK homepage at https://www.zak.kit.edu/begleitstudium-bak.php. The title of the examination and the amount of credits override the modules placeholders.

If you want to use ZAK achievements **both for your interdisciplinary qualifications and for the supplementary studies**, please record them in the interdisciplinary qualifications first. You can then get in contact with the ZAK study services (stg@zak.kit.edu) to also record them in your supplementary studies.

In the in-depth module, achievements have to be obtained in three different areas. The areas are as follows:

- Technology & Responsibility
- Doing Culture
- Media & Aesthetics
- Spheres of Life
- Global Cultures

You have to obtain two achievements with 3 credits each and one achievement with 5 credits. To self-record achievements in the in-depth module, you first have to elect the matching partial achievement.

Note: If you registered for the Supplementary Studies on Sustainable Development before April 1st, 2023, self-recording an achievement in this module counts as a request in the sense of §20 (2) of the regulations for the Supplementary Studies on Culture and Society. Your overall grade for the supplementary studies will thus be calculated as the average of the examantion grades, not as the average of the module grades.

Mandatory			
T-ZAK-112653	Basics Module - Self Assignment BAK	3 CR	Mielke, Myglas
In-depth Module (Election: 3 items)			
T-ZAK-112654	In-depth Module - Technology & Responsibility - Self Assignment BAK	3 CR	Mielke, Myglas
T-ZAK-112655	In-depth Module - Doing Culture - Self Assignment BAK	3 CR	Mielke, Myglas
T-ZAK-112656	In-depth Module - Media & Aesthetics - Self Assignment BAK	3 CR	Mielke, Myglas
T-ZAK-112657	In-depth Module - Spheres of Life - Self Assignment BAK	3 CR	Mielke, Myglas
T-ZAK-112658	In-depth Module - Global Cultures - Self Assignment BAK	3 CR	Mielke, Myglas
Mandatory			
T-ZAK-112660	Practice Module	4 CR	Mielke, Myglas
T-ZAK-112659	Oral Exam - Supplementary Studies on Culture and Society	4 CR	Mielke, Myglas

Competence Certificate

The monitoring is explained in the respective partial achievement.

They are composed of:

- minutes
- presentations
- a seminar paper
- an internship report
- an oral examination

After successful completion of the supplementary studies, the graduates receive a graded certificate and a KIT certificate.

Prerequisites
The offer is study-accompanying and does not have to be completed within a defined period of time. Enrolment or acceptance for graduation must be present when registering for the final examination.

KIT students register for the supplementary studies by selecting this module in the student portal and self-checking a performance. In addition, registration for the individual courses is necessary, which is possible shortly before the beginning of each semester.

The course catalogue, statutes (study regulations), registration form for the oral exam, and guides for preparing the various written performance requirements can be found as downloads on the ZAK homepage at www.zak.kit.edu/begleitstudium-bak.

Competence Goal
Graduates of the Supplementary Studies on Culture and Society demonstrate a sound basic knowledge of conditions, procedures and concepts for analysing and shaping fundamental social development tasks in connection with cultural topics. They have gained a well-founded theoretical and practical insight into various cultural studies and interdisciplinary topics in the field of tension between culture, technology and society in the sense of an expanded concept of culture.

They are able to place the contents selected from the specialization module in the basic context as well as to analyse and evaluate the contents of the selected courses independently and exemplarily and to communicate about them scientifically in written and oral form. Graduates are able to analyse social topics and problem areas and critically reflect on them in a socially responsible and sustainable perspective.

Content
The Supplementary Studies on Culture and Society can be started from the 1st semester and is not limited in time. It comprises at least 3 semesters. The supplementary studies are divided into 3 modules (basics, in-depth studies, practice). A total of 22 credit points (ECTS) are earned.

The thematic elective areas of the supplementary studies are divided into the following 5 modules and their sub-topics:

Block 1Technology & Responsibility

Value change / ethics of responsibility, technology development / history of technology, general ecology, sustainability

Block 2Doing Culture

Cultural studies, cultural management, creative industries, cultural institutions, cultural policy

Block 3Media & Aesthetics

Media communication, cultural aesthetics

Block 4Spheres of Life

Cultural sociology, cultural heritage, architecture and urban planning, industrial science

Block 5Global Cultures

Multiculturalism / interculturalism / transculturalism, science and culture

Module grade calculation
The overall grade of the supplementary studies is calculated as an average of the grades of the examination performances weighted with credit points.

In-depth Module

- presentation 1 (3 ECTS)
- presentation 2 (3 ECTS)
- seminar paper incl. presentation (5 ECTS)
- oral examination (4 ECTS)

Annotation
With the Supplementary Studies on Culture and Society, KIT provides a multidisciplinary study offer as an additional qualification, with which the respective specialized study program is supplemented by interdisciplinary basic knowledge and interdisciplinary orientation knowledge in the field of cultural studies, which is becoming increasingly important for all professions.

Within the framework of the supplementary studies, students acquire in-depth knowledge of various cultural studies and interdisciplinary subject areas in the field of tension between culture, technology and society. In addition to high culture in the classical sense, other cultural practices, common values and norms as well as historical perspectives of cultural developments and influences are considered.

In the courses, conditions, procedures and concepts for the analysis and design of fundamental social development tasks are acquired on the basis of an expanded concept of culture. This includes everything created by humans - also opinions, ideas, religious or other beliefs. The aim is to develop a modern concept of cultural diversity. This includes the cultural dimension of education, science and communication as well as the preservation of cultural heritage. (UNESCO, 1982)

According to § 16 of the statutes, a reference and a certificate are issued by the ZAK for the supplementary studies. The achievements are also shown in the transcript of records of the degree program and, upon request, in the certificate. They can also be recognized in the interdisciplinary qualifications (see elective information).

Workload
The workload is made up of the recommended number of hours for the individual modules:

- basic module approx. 90 h
- in-depth module approx. 340 h
- practical module approx. 120 h

total: approx. 550 h

Learning type

- lectures
- seminars
- workshops
- practical course

Literature
Recommended reading of primary and specialized literature will be determined individually by each instructor.

M 7.21 Module: Supplementary Studies on Sustainable Development [M-ZAK-106099]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: Additional Examinations

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
19	Grade to a tenth	Each term	3 terms	German	3	1

Election notes
With the exception of the final oral exam, students have to self-record the achievements obtained in the Supplementary Studies on Sustainable Development in their study plan. ZAK records the achievements as "non-assigned" under "ÜQ/SQ-Leistungen". Further instructions on self-recording of achievements can be found in the FAQ at https://campus.studium.kit.edu/ and on the ZAK homepage at https://www.zak.kit.edu/begleitstudium-bene. The title of the examination and the amount of credits override the modules placeholders.

If you want to use ZAK achievements **both for your interdisciplinary qualifications and for the supplementary studies**, please record them in the interdisciplinary qualifications first. You can then get in contact with the ZAK study services (stg@zak.kit.edu) to also record them in your supplementary studies.

In the elective module, you need to obtain 6 credits worth of achievements in two of the four areas:

- Sustainable Cities & Neighbourhoods
- Sustainable Assessment of Technology
- Subject, Body, Individual: The Other Side of Sustainability
- Sustainability in Culture, Economy & Society

Usually, two achievements with 3 credits each have to be obtained. To self-record achievements in the elective module, you first have to elect the matching partial achievement.

Note: If you registered for the Supplementary Studies on Sustainable Development before April 1st, 2023, self-recording an achievement in this module counts as a request in the sense of §19 (2) of the regulations for the Supplementary Studies on Sustainable Development. Your overall grade for the supplementary studies will thus be calculated as the average of the examantion grades, not as the average of the module grades.

Mandatory			
T-ZAK-112345	Basics Module - Self Assignment BeNe	3 CR	Myglas
Elective Module (Election: at least 6 credits)			
T-ZAK-112347	Elective Module - Sustainable Cities and Neighbourhoods - Self Assignment BeNe	3 CR	
T-ZAK-112348	Elective Module - Sustainability Assessment of Technology - Self Assignment BeNe	3 CR	
T-ZAK-112349	Elective Module - Subject, Body, Individual: the Other Side of Sustainability - Self Assignment BeNe	3 CR	
T-ZAK-112350	Elective Module - Sustainability in Culture, Economy and Society - Self Assignment BeNe	3 CR	
Mandatory			
T-ZAK-112346	Specialisation Module - Self Assignment BeNe	6 CR	Myglas
T-ZAK-112351	Oral Exam - Supplementary Studies on Sustainable Development	4 CR	

Competence Certificate
The monitoring is explained in the respective partial achievement .

They are composed of:

- protocols
- a reflection report
- presentations
- presentations
- the elaboration of a project work
- an individual term paper

Upon successful completion of the supplementary studies, graduates receive a graded report and a certificate issued by ZAK.

Prerequisites
The course is offered during the course of study and does not have to be completed within a defined period of time. Enrolment is required for all performance assessments of the modules of the supplementary studies. Participation in the supplementary studies is regulated by § 3 of the statutes.

KIT students register for the supplementary studies by selecting this module in the student portal and self-booking a performance. Registration for courses, performance assessments and examinations is regulated by § 6 of the Statutes and is usually possible shortly before the beginning of the semester.

The course catalogue, statutes (study regulations), registration form for the oral exam and guidelines for preparing the various written performance requirements can be found as downloads on the ZAK homepage at http://www.zak.kit.edu/begleitstudium-bene.

Competence Goal
Graduates of the supplementary studies in sustainable development acquire additional practical and professional competencies. Thus, the supplementary study program enables the acquisition of basics and initial experience in project management, trains teamwork skills, presentation skills and self-reflection, and also creates a fundamental understanding of sustainability that is relevant for all professional fields.

Graduates are able to analyse social topics and problem areas and critically reflect on them in a socially responsible and sustainable perspective. They are able to place the contents selected from the modules "Elective" and "Advanced" in the basic context as well as to independently and exemplarily analyse and evaluate the contents of the selected courses and to scientifically communicate about them in written and oral form.

Content
The supplementary study program Sustainable Development can be started from the 1st semester and is not limited in time. The wide range of courses offered by ZAK makes it possible to complete the program usually within three semesters. The supplementary studies comprise 19 credit points (LP). It consists of three modules: Basic Module, Elective Module and Advanced Module.

The thematic elective areas of the supplementary studies are divided into the following 4 modules and their subtopics in Module 2 (elective module):

Block 1 **Sustainable Cities and Neighbourhoods**

The courses provide an overview of the interaction of social, ecological, and economic dynamics in the microcosm of the city.

Block 2 **Sustainability Assessment of Technology**

Mostly based on ongoing research activities, methods and approaches of technology assessment are elaborated.

Block 3 **Subject, Body, Individual: The other Side of Sustainability**

Different approaches are presented to the individual perception, experience, shaping and responsibility of relationships to the environment and to oneself.

Block 4 **Sustainability in Culture, Economy & Society**

Courses usually have an interdisciplinary approach, but may also focus on one of the areas of culture, economics or society, both in application and in theory.

The core of the supplementary studies is a case study in the specialization area. In this project seminar, students conduct sustainability research with practical relevance themselves. The case study is supplemented by an oral examination with two topics from module 2 (elective module) and module 3 (in-depth module).

Module grade calculation
The overall grade of the supplementary studies is calculated as an average of the grades of the examination performances weighted with credit points.

Elective module

- Presentation 1 (3 ECTS)
- Presentation 2 (3 ECTS)

Advanced module

- individual term paper (6 ECTS)
- oral examination (4 ECTS)

Annotation

The Supplementary Studies on Sustainable Development at KIT is based on the conviction that a long-term socially and ecologically compatible coexistence in the global world is only possible if knowledge about necessary changes in science, economy and society is acquired and applied.

The interdisciplinary and transdisciplinary Studies on Sustainable Development enables diverse access to transformation knowledge as well as basic principles and application areas of sustainable development. According to the statutes § 16, a certificate is issued by the ZAK for the complementary studies.

The achievements are also shown in the transcript of records of the degree program and, upon request, in the certificate. They can also be recognized in the interdisciplinary qualifications (see elective information).
In the specialised studies, modules and partial achievements can be recognised within the framework of the additional achievements or e.g. the interdisciplinary qualifications. This must be regulated via the respective subject study programme.

The focus is on experience- and application-oriented knowledge and competences, but theories and methods are also learned. The aim is to be able to represent one's own actions as a student, researcher and later decision-maker as well as an individual and part of society under the aspect of sustainability.

Sustainability is understood as a guiding principle to which economic, scientific, social and individual actions should be oriented. According to this, the long-term and socially just use of natural resources and the material environment for a positive development of global society can only be addressed by means of integrative concepts. Therefore, "education for sustainable development" in the sense of the United Nations programme plays just as central a role as the goal of promoting "cultures of sustainability". For this purpose, practice-centred and research-based learning of sustainability is made possible and the broad concept of culture established at ZAK is used, which understands culture as habitual behaviour, lifestyle and changing context for social actions.

The supplementary study programme conveys the basics of project management, trains teamwork skills, presentation skills and self-reflection. Complementary to the specialised studies at KIT, it creates a fundamental understanding of sustainability, which is important for all professional fields. Integrative concepts and methods are essential: in order to use natural resources in the long term and to shape the global future in a socially just way, not only different disciplines, but also citizens, practitioners and institutions must work together.

Workload

The workload is made up of the number of hours of the individual modules:

- Basic module approx. 180 h
- Elective module approx. 150 h
- Consolidation module approx. 180 h

Total: approx. 510 h

Learning type

- lectures
- seminars
- workshops

Literature

Recommended reading of primary and specialist literature is determined individually by the respective lecturer.

M 7.22 Module: Sustainable Energy Technology [M-MACH-106385]

Responsible: Prof. Dr.-Ing. Hans-Jörg Bauer
Prof. Dr. Thomas Koch

Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechanical Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each summer term	2 terms	German	2	1

Sustainable Energy Technology (Election: at most 3 items as well as at least 12 credits)			
T-MACH-112959	Introduction to Energy Technology	4 CR	Bauer
T-MACH-112961	Measurement Technology, Data Transmission and Data Analysis in Energy Technology	4 CR	Koch
T-MACH-112962	Thermochemical Energy Conversion and Energy Storage	4 CR	Maas

Competence Certificate
See individual courses.

Prerequisites
none

Module grade calculation
Average of graded exams (with equal weight).

Workload
360 hours, of which 135 - 180 hours of attendance time, depending on the choice of courses

Learning type
lectures/ tutorials, depending on the choice of courses

Literature
see individual courses

M 7.23 Module: Sustainable Production Economics (BSc-Modul 22 MWT) [M-MACH-105902]

Responsible: Prof. Dr.-Ing. Kai Furmans
Prof. Dr.-Ing. Gisela Lanza

Organisation: KIT Department of Mechanical Engineering

Part of: Fundamentals of Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German	3	2

Mandatory			
T-MACH-111859	Sustainable Production Economics	5 CR	Furmans, Lanza

Competence Certificate
Written Exam (90 minutes)

Prerequisites
none

Competence Goal
After successful completion of the course, the students are able …

- to discuss, alone and in a team, the terms, contexts and models by which manufacturing companies are described;
- to discuss typical problems of manufacturing companies, especially against the background of current and future challenges of ecological, social and economic sustainability;
- to apply the most important methods for efficient and sustainable management in industrial enterprises, in particular in the sense of the circular economy, in a problem-related manner;
- to select and justify decision-making alternatives by applying the methods learned;
- to critically question the methods learned and to independently acquire methods that go beyond this.

Content
The module conveys an overall understanding of operational production management with special consideration of aspects of sustainability as well as an application-oriented understanding of the fundamental issues and methods in industrial companies. Through exercises as well as a business game synchronous to the lecture, the taught contents are deepened through application, so that the participants can apply them directly in their later professional environment.

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

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

For the Bachelor's program Mechanical Engineering (International) a comparable module with comparable courses is offered in English.

Workload
Regluar attendance: 42 hours
Self-study: 108 hours

Learning type

1. Lectures (Obligatory)
2. Tutorials (Obligatory)

M 7.24 Module: Technical Thermodynamics [M-MACH-106377]

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

Part of: Fundamentals of Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
14	Grade to a tenth	Each winter term	2 terms	German	2	1

Mandatory			
T-MACH-112910	Tutorial Technical Thermodynamics and Heat Transfer I *This item will not influence the grade calculation of this parent.*	1 CR	Maas
T-MACH-112912	Technical Thermodynamics and Heat Transfer I	6 CR	Maas
T-MACH-112911	Tutorial Technical Thermodynamics and Heat Transfer II *This item will not influence the grade calculation of this parent.*	1 CR	Maas
T-MACH-112913	Technical Thermodynamics and Heat Transfer II	6 CR	Maas

Competence Certificate
See individual courses

Prerequisites
None

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

An integral part of the module is that students can define the fundamental laws of thermodynamics and their applications. The students are competent in describing and comparing the main processes in energy conversion that are important in mechanical engineering. Using tools also applied in industry, they are capable of analyzing and rating the efficiency of processes. The students are capable of discussing the thermodynamic correlation of ideal gas mixtures, real gases, and humid air, as well as explaining the properties on a molecular basis and analyzing them with the help of the laws of thermodynamics. Furthermore, the students are capable of explaining chemical reactions in the context of thermodynamics as well as defining and applying the heat and mass transfer mechanisms.

Content
Thermodynamics I:

- System, properties of state
- Absolute temperature, model systems
- 1st law of thermodynamics for resting and moving systems
- Entropy and 2nd law of thermodynamics
- Behavior of real substances described by tables, diagrams and equations of state
- Machine processes
- Mixtures of ideal and real compounds
- Behavior of mixtures
- Moist air

Thermodynamics II:

- Repetition of the topics of "Thermodynamics and Heat Transfer I"
- Structure of matter, chemical fundamentals
- Kinetic theory of gases
- Behavior of real substances described by equations of state
- Chemical reactions and applications of the laws of thermodynamics to chemical reactions
- Reaction kinetics
- Heat and mass transfer

Module grade calculation
Weighting according to credit points.

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

It will be offered for the first time starting from the winter semester of 2024/2025.

Workload
Lecture and exercises: 150h

Homewordk and preparation of examination: 270h

Learning type
Lecture
Exercise course
Tutorial

Literature
Script

Additional literature will be provided in the lecture.

8 Courses

T 8.1 Course: Additive Manufacturing: Development and Manufacturing of Metallic Components [T-MACH-112974]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106386 - Applied Materials
M-MACH-106387 - Human-Centered Product Development and Production

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

Competence Certificate
written exam, duration 60 minutes

T 8.2 Course: Advanced Mathematics I [T-MATH-100275]

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

Organisation: KIT Department of Mathematics

Part of: M-MACH-106403 - Orientation Exam
M-MATH-102859 - Advanced Mathematics

Type	Credits	Grading scale	Recurrence	Version
Written examination	7	Grade to a third	Each term	3

Events					
WT 23/24	0131000	Höhere Mathematik I für die Fachrichtung Maschinenbau, Geodäsie, Materialwissenschaft und Werkstofftechnik	4 SWS	Lecture	Hettlich
WT 23/24	0131200	Höhere Mathematik I für die Fachrichtungen Chemieingenieurwesen, Verfahrenstechnik, Bioingenieurwesen und MIT	4 SWS	Lecture	Hettlich
Exams					
WT 23/24	6700007	Advanced Mathematics I			Arens, Griesmaier, 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 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 8.3 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	Grading scale	Recurrence	Version
Written examination	7	Grade to a third	Each term	2

Events					
ST 2024	0180800	Höhere Mathematik II für die Fachrichtungen Maschinenbau, Geodäsie, Materialwissenschaft und Werkstofftechnik	4 SWS	Lecture	Arens
ST 2024	0181000	Höhere Mathematik II für die Fachrichtungen Chemieingenieurwesen, Verfahrenstechnik, Bioingenieurwesen und MIT	4 SWS	Lecture	Arens
Exams					
WT 23/24	6700008	Advanced Mathematics II			Arens, Griesmaier, 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 8.4 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	Grading scale	Recurrence	Version
Written examination	7	Grade to a third	Each term	2

Events					
WT 23/24	0131400	Höhere Mathematik III für die Fachrichtungen Maschinenbau, Chemieingenieurwesen, Verfahrenstechnik, Bioingenieurwesen und das Lehramt Maschinenbau	4 SWS	Lecture	Arens
Exams					
WT 23/24	6700009	Advanced Mathematics III			Arens, Griesmaier, 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.

T 8.5 Course: Artificial Intelligence in Production [T-MACH-112970]

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

Part of: M-MACH-106384 - Intelligent Systems
M-MACH-106387 - Human-Centered Product Development and Production

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

Competence Certificate
written exam, duration 60 minutes

Prerequisites
none

T 8.6 Course: Automation and Autonomy in Logistics [T-MACH-113010]

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

Part of: M-MACH-106384 - Intelligent Systems

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

Competence Certificate
Written exam, duration 60 minutes

Prerequisites
none

Recommendation
none

T 8.7 Course: Bachelor's Thesis [T-MACH-113045]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106422 - Bachelor's Thesis

Type	Credits	Grading scale	Recurrence	Version
Final Thesis	12	Grade to a third	Each term	1

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

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

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

The bachelor thesis is to be evaluated by not less than a professor or habilitated faculty member and one other examiner. Generally, one of the two examiners is the person who has assigned the thesis.

If the examiners do not agree, the bachelor thesis is graded by the examination board within this assessment; another expert can be appointed too. The bachelor thesis has to be graded within a period of six weeks after the submission.

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

Final Thesis
This course represents a final thesis. The following periods have been supplied:

Submission deadline	3 months
Maximum extension period	1 months
Correction period	6 weeks

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

T 8.8 Course: Basics in Measurement and Control Systems [T-MACH-104745]

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

Part of: M-MACH-102564 - Measurement and Control Systems

Type	Credits	Grading scale	Recurrence	Version
Written examination	7	Grade to a third	Each winter term	3

Events					
WT 23/24	2137301	Measurement and Control Systems	3 SWS	Lecture / 🗣	Stiller
WT 23/24	2137302	Measurement and Control Systems (Tutorial)	1 SWS	Practice / 🗣	Stiller, Rack
WT 23/24	3137020	Measurement and Control Systems	3 SWS	Lecture / 🗣	Stiller
WT 23/24	3137021	Measurement and Control Systems (Tutorial)	1 SWS	Practice / 🗣	Stiller, Fischer, Hauser
Exams					
WT 23/24	76-T-MACH-104745	Basis of Measurement and Control Systems			Stiller
ST 2024	76-T-MACH-104745	Basis of Measurement and Control Systems			Stiller

Legend: 🖥 Online, ❂ Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
written exam

2,5 hours

Prerequisites
none

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

V Measurement and Control Systems

2137301, WS 23/24, 3 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content
Lehrinhalt (EN):

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

Lernziele (EN):

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

Voraussetzungen (EN)

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

Nachweis (EN)

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

Arbeitsaufwand (EN):

210 hours

Literature
Buch zur Vorlesung:
C. Stiller: Grundlagen der Mess- und Regelungstechnik, Shaker Verlag, Aachen, 2005

- Measurement and Control Systems:

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

- Regelungstechnische Bücher:

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

- Messtechnische Bücher:

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

V **Measurement and Control Systems** **Lecture (V)**
3137020, WS 23/24, 3 SWS, Language: English, Open in study portal **On-Site**

Content
Lehrinhalt (EN):

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

Lernhziele (EN):

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

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

Arbeitsaufwand (EN): 180 hours

Literature

- Measurement and Control Systems:

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

- Regelungstechnische Bücher:

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

- Messtechnische Bücher:

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

V **Measurement and Control Systems (Tutorial)**
3137021, WS 23/24, 1 SWS, Language: English, Open in study portal

Practice (Ü)
On-Site

Content
Tutorial for Measurement and Control Systems

T 8.9 Course: Basics Module - Self Assignment BAK [T-ZAK-112653]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Completed coursework	3	pass/fail	1

Competence Certificate
The monitoring in this module includes a course credit according to § 5 section 4 in the form of minutes of which two are to be handed in freely chosen topics of the lecture series " Introduction to Applied Studies on Culture and Society ". Length: approx. 6,000 characters each (incl. spaces).

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation
Fjordevik, Anneli und Jörg Roche: Angewandte Kulturwissenschaften. Vol. 10. Narr Francke Attempto Verlag, 2019.

Annotation
The Basic Module consists of the lecture “Introduction to Supplementary Studies on Culture and Society”, which is offered only in the winter semester. It is therefore recommended that students start their studies in the winter semester and complete them before module 2.

8.10 Course: Basics Module - Self Assignment BeNe [T-ZAK-112345]

Responsible: Christine Myglas
Organisation:
Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Completed coursework	3	pass/fail	1

Competence Certificate
The monitoring in this module includes a course credit according to § 5 section 4:

Introduction to Sustainable Development in the form of minutes of which two are to be handed in freely chosen topics of the lecture series "Introduction to Sustainable Development". Length: approx. 6,000 characters each (incl. spaces).

or

Sustainability Spring Days at KIT in the form of a reflection report on all components of the project days "Sustainability Spring Days at KIT". Length approx. 12,000 characters (incl. spaces).

Prerequisites
None

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation
Kropp, Ariane: Grundlagen der Nachhaltigen Entwicklung: Handlungsmöglichkeiten und Strategien zur Umsetzung. Springer-Verlag, 2018.

Pufé, Iris: Nachhaltigkeit. 3. überarb. Edition, UTB, 2017.

Roorda, Niko, et al.: Grundlagen der nachhaltigen Entwicklung. Springer-Verlag, 2021.

Annotation
Module Basics consists of the lecture " Introduction to Sustainable Development ", which is only offered in the summer semester or alternatively of the project days " Sustainability Spring Days at KIT ", which is only offered in the winter semester. It is recommended to complete the course before Elective Module an Specialisation Module.

In exceptional cases, Elective Module or Specialisation Module can also be completed simultaneously with Basics Module. However, the prior completion of the advanced modules Elective and Specialisation should be avoided.

T 8.11 Course: Basics of Computational Dynamics [T-MACH-113006]

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

Part of: M-MACH-106383 - Computational Engineering

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

Competence Certificate
oral exam, duration approx. 20 min.

Prerequisites
none

8.12 Course: Basics of Electrical Engineering [T-ETIT-112934]

Responsible: Dr.-Ing. Matthias Brodatzki
Prof. Dr. Martin Doppelbauer

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-MACH-106380 - Electrical Engineering and Mechatronics

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

Prerequisites
none

T 8.13 Course: Basics of Manufacturing Technology [T-MACH-112928]

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

Part of: M-MACH-106376 - Manufacturing Technology and Materials Science

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

Events					
WT 23/24	2149658	Basics of Manufacturing Technology	2 SWS	Lecture / Practice (/	Schulze
Exams					
WT 23/24	76-T-MACH-112928	Basics of Manufacturing Technology			Schulze

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

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 23/24, 2 SWS, Language: German, Open in study portal

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

Content

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

The following topics will be covered:

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

Learning Outcomes:

The students ...

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

Workload:

regular attendance: 30 hours
self-study: 60 hours

Literature

Medien:

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

Media:

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

T 8.14 Course: Basics of Mechatronics [T-MACH-112937]

Responsible: Prof. Dr.-Ing. Alexander Fidlin
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106380 - Electrical Engineering and Mechatronics

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

Competence Certificate
Written exam, 180 Min.

Prerequisites
The course T-MACH-113008 – Tutorial Basics of Mechatronics must have been passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-113008 - Tutorial Basics of Mechatronics must have been passed.

T 8.15 Course: Basics of Production Automation [T-MACH-112971]

Responsible: Prof. Dr.-Ing. Jürgen Fleischer
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106382 - Mobility Systems
M-MACH-106384 - Intelligent Systems
M-MACH-106387 - Human-Centered Product Development and Production

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

Competence Certificate
written exam, duration 60 minutes

Prerequisites
none

T 8.16 Course: Basics of Technical Logistics [T-MACH-113013]

Responsible: Dr.-Ing. Martin Mittwollen
Dr.-Ing. Jan Oellerich

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106382 - Mobility Systems

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

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

Prerequisites
none

Recommendation
Knowledge of the basics of technical mechanics preconditioned.

T 8.17 Course: Computational Continuum Mechanics [T-MACH-112987]

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

Part of: M-MACH-106383 - Computational Engineering

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

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

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

Prerequisites
Coursework in *Tutorial Computational Continuum Mechanics* (T-MACH-112996) must be passed

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-112996 - Tutorial Computational Continuum Mechanics must have been passed.

T 8.18 Course: Computational Dynamics [T-MACH-105349]

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

Part of: M-MACH-106383 - Computational Engineering

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

Events					
WT 23/24	2162246	Computational Dynamics	2 SWS	Lecture / 🖥	Proppe
ST 2024	2162246	Computational Dynamics	2 SWS	Lecture / 🗣	Proppe
Exams					
WT 23/24	76-T-MACH-105349	Computational Dynamics			Proppe
ST 2024	76-T-MACH-105349	Computational Dynamics			Proppe

Legend: 🖥 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
oral exam, duration approx. 20 min.

Prerequisites
none

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

V Computational Dynamics
2162246, WS 23/24, 2 SWS, Language: German, Open in study portal

Lecture (V)
Online

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

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

V Computational Dynamics
2162246, SS 2024, 2 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

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

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

T 8.19 Course: Computational Vehicle Dynamics [T-MACH-105350]

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

Part of: M-MACH-106382 - Mobility Systems

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

Events					
WT 23/24	2162256	Computational Vehicle Dynamics	2 SWS	Lecture / 🖥	Proppe
ST 2024	2162256	Computational Vehicle Dynamics	2 SWS	Lecture / 🖥	Proppe
Exams					
WT 23/24	76-T-MACH-105350	Computational Vehicle Dynamics			Proppe
ST 2024	76-T-MACH-105350	Computational Vehicle Dynamics			Proppe

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

Competence Certificate
oral exam, 30 min.

Prerequisites
none

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

V Computational Vehicle Dynamics

2162256, WS 23/24, 2 SWS, Language: German, Open in study portal

Lecture (V)
Online

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

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

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

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

V Computational Vehicle Dynamics

2162256, SS 2024, 2 SWS, Language: German, Open in study portal

Lecture (V)
Online

Content

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

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

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

Literature

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

T 8.20 Course: Continuum Mechanics of Solids and Fluids [T-MACH-110377]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Prof. Dr.-Ing. Bettina Frohnapfel

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106383 - Computational Engineering
M-MACH-106386 - Applied Materials

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

Events					
WT 23/24	2161252	Continuum mechanics of solids and fluids	2 SWS	Lecture / 🗣	Böhlke, Frohnapfel
Exams					
WT 23/24	76-T-MACH-110377	Continuum mechanics of solids and fluids			Böhlke, Frohnapfel

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

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

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

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-110333 - Tutorial Continuum Mechanics of Solids and Fluids must have been passed.

Annotation
Due to capacity reasons it is possible that not all students of this course can be admitted to the computer tutorials. Students of the bachelor's degree program in mechanical engineering who have chosen the Major Field Continuum Mechanics (SP-Nr 13) and students of the bachelor's degree program in material science and material technology will be admitted to the computer tutorials in any case.
If additional places are available in the computer tutorials for this course, these will be allocated according to the BSc average grade.

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

V Continuum mechanics of solids and fluids

2161252, WS 23/24, 2 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content

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

Literature
Vorlesungsskript

Greve, R.: Kontinuumsmechanik, Springer 2003

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

Schade, H.: Strömungslehre, de Gruyter 2013

T 8.21 Course: Cutting: Development and Manufacturing of Metallic Components [T-MACH-112973]

Responsible: Prof. Dr.-Ing. Volker Schulze
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106387 - Human-Centered Product Development and Production

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

Competence Certificate
written exam, duration 60 minutes

T 8.22 Course: Dimensioning of Additive-Manufactured Polymer Structures at an Example from Medical Engineering [T-MACH-112717]

Responsible: Prof. Dr.-Ing. Luise Kärger
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106383 - Computational Engineering
M-MACH-106387 - Human-Centered Product Development and Production

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

Events					
ST 2024	2114102	Dimensioning of additive-manufactured polymer structures at an example from medical engineering	3 SWS	Lecture / Practice (/	Kärger
Exams					
WT 23/24	76-T-MACH-112717-W	Dimensioning of Additive-Manufactured Polymer Structures at an Example from Medical Engineering (repeat)			Kärger
ST 2024	76-T-MACH-112717	Dimensioning of additive-manufactured polymer structures at an example from medical engineering			Kärger

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

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

V Dimensioning of additive-manufactured polymer structures at an example from medical engineering

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

2114102, SS 2024, 3 SWS, Language: German, Open in study portal

Content

Additive manufacturing (AM) processes, also known as "3D printing", allow the economical production of individualised components with a high degree of design freedom. This makes them particularly important in industries with very low quantities and many prototype tests, such as medical engineering. In orthopaedics, for example, it is often helpful to adapt splints or orthoses to the patient's individual anatomy and functional requirements. Due to their good processability, adjustable properties and low density, polymer-based materials are increasingly applied. However, the goal-oriented development of such customised polymer components requires knowledge of the according processes and materials and can be effectively supported by computer-aided CAE methods.

In the course, students learn about additive manufacturing (AM) of individualised polymer components and apply their competences in a development project during the semester. The course first provides an overview of established AM process technologies and uses the example of extrusion processes to work out the interaction of material, process settings and design. Special requirements of medical technology for component development and material selection are presented in separate lectures. This is followed by an application-oriented introduction to the practical component design of printed polymer structures using the finite element method (FEM). FE-based topology optimisation is presented as a particularly suitable tool to devise efficient mechanical structures. The CAE design methods are specifically deepened in practice in exercises. With this knowledge of processes, materials and methods, the students finally solve an individual development project from the field of orthotics in small groups.

Main topics:

- Overview of additive manufacturing processes
- Process-material-component interaction
- Polymers in additive manufacturing:

Fundamentals of polymer science, material and component testing,

- Special aspects of additive manufacturing in medical technology (external guest contributions):

Selection of process and material, orthotics/prosthetics as an application case

- Computer-aided component design and optimisation
- (lectures and exercises)
- Semester project:
  Design, manufacture and testing of an AM component from the field of "medical technology

Learning objectives

The students can...

- ... name and describe different AM manufacturing technologies for polymer components and select them based on their characteristics (especially advantages/disadvantages and process limits).
- ... describe the development chain in additive manufacturing

(material selection, CAD, simulation/optimisation, slicer software) and implement it.

- ... describe the interaction of process parameters, material properties and design for polymer components at the example of extrusion processes.
- ... name and explain relevant additional medical technology aspects, e.g. sterilisability or allergy potential, in material and process selection
- ... explain essential concepts of the finite element method and topology optimisation
- ... use the finite element software "Abaqus" for component design and evaluate simulation results with regard to informative value and load-bearing capacity
- ... carry out a topology optimisation with the software Tosca, interpret its results and derive structural concepts.
- ... successfully realise an individual development project in the area of additive manufacturing in a goal-oriented manner.

Organizational issues

Die Raumbelegung und der wöchentliche Veranstaltungstermin wird zu Beginn des Sommersemesters auf der Homepage des Instituts bekannt gegeben.

Aufgrund des gewünschten Betreuungsverhältnisses und der Institutsausstattung ist die maximale Anzahl der teilnehmenden Studierenden begrenzt. Die Anmeldung erfolgt über die Instituts-Homepage ab Anfang März.

Zusätzliche Übungen werden an weiteren fünf Terminen immer von **15:45 – 17:15 in R. 125**, Geb. 70.04, Campus Ost stattfinden: 29.05., 06.06, 20.06, 27.06., 04.07.24.

The room allocation and the weekly course dates are announced on the Institute's homepage at the beginning of the summer semester.

Due to the desired supervision ratio and the institute's equipment, the maximum number of participating students is limited.

Registration takes place via the Institute's homepage from the beginning of March.

Additional exercises will take place on 5 dates from 15:45 - 17:15 in room 125 at Building 70.04, Campus East: 29.05., 06.06, 20.06., 27.06., 04.07.24.

T 8.23 Course: Dynamics of the Automotive Drive Train [T-MACH-105226]

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

Part of: M-MACH-106382 - Mobility Systems

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

Events					
WT 23/24	2163111	Dynamics of the Automotive Drive Train	2 SWS	Lecture / 🗣	Fidlin
WT 23/24	2163112	Übungen zu Dynamik des Kfz-Antriebsstrangs	2 SWS	Practice	Fidlin, Gießler
Exams					
WT 23/24	76-T-MACH-105226	Dynamics of the Automotive Drive Train			Fidlin
ST 2024	76-T-MACH-105226	Dynamics of the Automotive Drive Train			Fidlin

Legend: 🖥 Online, ❖ Blended (On-Site/Online), 🗣 On-Site, × Cancelled

Competence Certificate
Oral examination, 30 min.

Prerequisites
none

Recommendation
Powertrain Systems Technology A: Automotive SystemsMachine DynamicsVibration Theory

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

V Dynamics of the Automotive Drive Train
2163111, WS 23/24, 2 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content

- Main components of the vehicle powertrain and their modelling
- Typical driving situations
- Problemoriented models for particular driving situations
- System analysis and optimization with respect to dynamic behavior

Literature

- Dresig H. Schwingungen mechanischer Antriebssysteme, 2. Auflage, Springer, 2006
- Pfeiffer F., Mechanical System Dynamics, Springer, 2008
- Laschet A., Simulation von Antriebssystemen:Modellbildung der Schwingungssysteme und Beispiele aus der Antriebstechnik, Springer, 1988

V Übungen zu Dynamik des Kfz-Antriebsstrangs
2163112, WS 23/24, 2 SWS, Language: German, Open in study portal

Practice (Ü)

Content
Exercises related to the lecture

T 8.24 Course: Elective Module - Subject, Body, Individual: the Other Side of Sustainability - Self Assignment BeNe [T-ZAK-112349]

Organisation:

Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate

Examination of another kind according to § 7 section 7 in the form of a presentation in the selected course.

Prerequisites

Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues

This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation

The content of the Basics Module is helpful.

T 8.25 Course: Elective Module - Sustainability Assessment of Technology - Self Assignment BeNe [T-ZAK-112348]

Organisation:

Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
Examination of another kind according to § 7 section 7 in the form of a presentation in the selected course.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation
The content of the Basics Module is helpful.

T 8.26 Course: Elective Module - Sustainability in Culture, Economy and Society - Self Assignment BeNe [T-ZAK-112350]

Organisation:

Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
Examination of another kind according to § 7 section 7 in the form of a presentation in the selected course.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation
The content of the Basics Module is helpful.

T 8.27 Course: Elective Module - Sustainable Cities and Neighbourhoods - Self Assignment BeNe [T-ZAK-112347]

Organisation: University

Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
Examination of another kind according to § 7 section 7 in the form of a presentation in the selected course.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation
The content of the Basics Module is helpful.

T 8.28 Course: Engineering Mechanics I [T-MACH-112904]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106374 - Engineering Mechanics
M-MACH-106403 - Orientation Exam

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

Events					
WT 23/24	2161245	Engineering Mechanics I	3 SWS	Lecture / 🗣	Böhlke
Exams					
WT 23/24	76-T-MACH-100282	Engineering Mechanics I			Böhlke, Langhoff

Legend: 🖥 Online, ❖ Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
written exam, 90 minutes, graded. Additives as announced

Prerequisites
Coursework in *Tutorial Engineering Mechanics I* (T-MACH-112907) must be passed

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-112907 - 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 23/24, 3 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

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

Literature

- Vorlesungsskript
- 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 8.29 Course: Engineering Mechanics II [T-MACH-112905]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106374 - Engineering Mechanics

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

Events					
ST 2024	2162250	Engineering Mechanics II	3 SWS	Lecture / 🗣	Böhlke, Langhoff

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, × Cancelled

Competence Certificate
written exam, 90 minutes, graded. Additives as announced

Prerequisites
Coursework in *Tutorial Engineering Mechanics II* (T-MACH-112908) must be passed

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-112908 - 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 2024, 3 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content

- bending
- shear
- torsion
- stress and strain state in 3D
- Hooke's law in 3D
- elasticity theors in 3D
- energy methods in elastostatics
- approximation methods
- stability of elastic bars

Literature
Vorlesungsskript
Hibbeler, R.C: Technische Mechanik 2 - Festigkeitslehre. Prentice Hall. Pearson Studium 2005.
Gross, D. et al.: Technische Mechanik 2 - Elastostatik. Springer 2006.
Gummert, P.; Reckling, K.-A.: Mechanik. Vieweg 1994.
Parkus, H.: Mechanik der festen Körper. Springer 1988.

T 8.30 Course: Engineering Mechanics III [T-MACH-112906]

Responsible: N.N.
Prof. Dr.-Ing. Carsten Proppe

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106374 - Engineering Mechanics

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

Competence Certificate
Written exam, duration: 180 minutes

Prerequisites
Coursework in *Tutorial Engineering Mechanics III* (T-MACH-112909) must have been passed

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-112909 - Tutorial Engineering Mechanics III must have been passed.

T 8.31 Course: Experimental Dynamics [T-MACH-105514]

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

Part of: M-MACH-106383 - Computational Engineering

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

Events					
ST 2024	2162225	Experimental Dynamics	3 SWS	Lecture / ✕	Fidlin
ST 2024	2162228	Übungen zu Experimentelle Dynamik	2 SWS	Practice / ✕	Fidlin, Genda
Exams					
WT 23/24	76-T-MACH-105514	Experimental Dynamics			Fidlin

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
oral exam, 30 min.

Prerequisites
Can not be combined with Practical Training in Measurement of Vibrations (T-MACH-105373).

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

V Experimental Dynamics
2162225, SS 2024, 3 SWS, Language: German, Open in study portal

Lecture (V)
Cancelled

Content

1. Introduction
2. Measurement principles
3. Sensors as coopled multi-physical systems
4. Digital signal processing, measurements in frequency domain
5. Forced non-linear vibrations
6. Stability problems (Mathieu oscillator, friction induces vibrations)
7. Elementary rotor dynamics
8. Modal analysis

Organizational issues
Die Vorlesung Experimentelle Dynamik wird im Sommersemester 2024 nicht angeboten.

T 8.32 Course: Fluid Mechanics [T-MACH-112933]

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

Part of: M-MACH-106378 - Fluid Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	7	Grade to a third	Each summer term	1 terms	1

Competence Certificate
Written exam 2h

Prerequisites
none

T 8.33 Course: Functional Materials [T-MACH-113011]

Responsible: Dr. Patric Gruber
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106386 - Applied Materials

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

Competence Certificate
Oral examination, duration approx. 25 minutes

Prerequisites
none

T 8.34 Course: Fundamentals of Combustion Engine Technology [T-MACH-113005]

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-106382 - Mobility Systems

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

Competence Certificate
written exam, 60 min.

Prerequisites
none

Annotation
This course consists of a lecture (V2) and a tutorial (Ü1).

T 8.35 Course: Group work IT and Data Science [T-MACH-113410]

Responsible: Prof. Dr.-Ing. Anne Meyer
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106388 - IT and Data Science

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

Events					
ST 2024	2122371	Tutorial IT and Data Science	2 SWS	Practice / 🗣	Meyer

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The continuous teamwork during the attendance period and the functional team solution developed are assessed.

Prerequisites
none

T 8.36 Course: Human Factors Engineering I [T-MACH-105518]

Responsible: Prof. Dr.-Ing. Barbara Deml
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106387 - Human-Centered Product Development and Production

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

Events					
WT 23/24	2109035	Human Factors Engineering I: Ergonomics	2 SWS	Lecture / 🗣	Deml
Exams					
WT 23/24	76-T-MACH-105518	Human Factors Engineering I			Deml
ST 2024	76-T-MACH-105518	Human Factors Engineering I			Deml

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
written exam, 60 minutes

The exams are only offered in German!

Prerequisites
none

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

V Human Factors Engineering I: Ergonomics

2109035, WS 23/24, 2 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content
The course "Human Factors Engineering I: Ergonomics" takes place in the first half of the semester on Wednesday and Thursday.

In the second half of the semester the course "Human Factors Engineering II: Work Organisation" takes place on Wednesday and Thursday.

Content of teaching:

1. Principles of human work
2. Behavioural-science data acquisition
3. workplace design
4. work environment design
5. work management
6. labour law and advocay groups

Learning target:

The students acquire a basic knowledge in the field of ergonomics:

- They are able to consider cognitive, physiological, anthropometric, and safety technical aspects in order to design workplaces ergonomically.
- Just as well they know physical and psycho-physical fundamentals (e. g. noise, lighting, climate) in the field of work-environmental design.
- Furthermore the students are able to evaluate workplaces by knowing and being able to apply essential methods of time studies and payment systems.
- Finally, they get a first, overall insight into the German labour law as well as into the organisation of advocacy groups beyond companies.

Further on the participants get to know basic methods of behavioral-science data acquisition (e. g. eye-tracking, ECG, dual-task-paradigm).

Organizational issues
Die Veranstaltung "Arbeitswissenschaft I: Ergonomie" findet in der ersten Hälfte des Semesters am Mittwoch und Donnerstag bis zum 14.12.2023 statt.

Ab dem 20.12.2023 findet die Veranstaltung "Arbeitswissenschaft II: Arbeitsorganisation" am Mittwoch und Donnerstag statt.

- schriftliche Prüfung

- Die Vorlesung hat einen Arbeitsaufwand von 120 h (=4 LP).

Mit einer gültigen KIT-E-Mail-Adresse können Sie das Passwort bei elisabeth.schlund@kit.edu schriftlich erfragen.

Literature
Die Kursmaterialien stehen auf ILIAS zum Download zur Verfügung.

T 8.37 Course: Hybrid and Electric Vehicles [T-ETIT-100784]

Responsible: Prof. Dr. Martin Doppelbauer
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-MACH-106382 - Mobility Systems

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

Events					
WT 23/24	2306321	Hybrid and Electric Vehicles	2 SWS	Lecture / 🔀	Doppelbauer
WT 23/24	2306323	Tutorial for 2306323 Hybrid and Electric Vehicles	1 SWS	Practice / 🔀	Doppelbauer
Exams					
WT 23/24	7306321	Hybrid and Electric Vehicles			Doppelbauer
ST 2024	7306321	Hybrid and Electric Vehicles			Doppelbauer

Legend: 🖥 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
none

T 8.38 Course: Improving Your Speech. Convincing by Personality [T-ZAK-113104]

Organisation:
Part of: M-MACH-106389 - Key Competences

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each winter term	1

Events					
WT 23/24	1130031	Improving your speech. Convincing by personality	2 SWS	Block / 🗣	Bock

Legend: 🖥 Online, ❂ Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale

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

V Improving your speech. Convincing by personality

1130031, WS 23/24, 2 SWS, Language: German, Open in study portal

Block (B)
On-Site

Content
This seminar is held in German. For additional information please visit the website in German.

T 8.39 Course: In-depth Module - Doing Culture - Self Assignment BAK [T-ZAK-112655]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
At least two presentations must be given: An examination of another kind according to § 5 section 3 (3) in the form of a presentation in one of the chosen courses (3 ECT).
In a third seminar, either (a) a presentation is held (preliminary study achievement) which remains not graded and a topic-related term paper is submitted or (b) a written exam is taken.
The three courses can be selected individually from the 5 thematic blocks or – in exceptional cases and according to the agreement with the responsible lecturer – all three courses can be selected from one block in the sense of a specialization.
In addition, an oral examination is taken, which relates to the content of two of the chosen three courses.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Annotation
The content of the Basic Modul is helpful.

T 8.40 Course: In-depth Module - Global Cultures - Self Assignment BAK [T-ZAK-112658]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
At least two presentations must be given: An examination of another kind according to § 5 section 3 (3) in the form of a presentation in one of the chosen courses (3 ECT).
In a third seminar, either (a) a presentation is held (preliminary study achievement) which remains not graded and a topic-related term paper is submitted or (b) a written exam is taken.
The three courses can be selected individually from the 5 thematic blocks or – in exceptional cases and according to the agreement with the responsible lecturer – all three courses can be selected from one block in the sense of a specialization.
In addition, an oral examination is taken, which relates to the content of two of the chosen three courses.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Annotation
The content of the Basic Modul is helpful.

T 8.41 Course: In-depth Module - Media & Aesthetics - Self Assignment BAK [T-ZAK-112656]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate

At least two presentations must be given: An examination of another kind according to § 5 section 3 (3) in the form of a presentation in one of the chosen courses (3 ECT).
In a third seminar, either (a) a presentation is held (preliminary study achievement) which remains not graded and a topic-related term paper is submitted or (b) a written exam is taken.
The three courses can be selected individually from the 5 thematic blocks or – in exceptional cases and according to the agreement with the responsible lecturer – all three courses can be selected from one block in the sense of a specialization.
In addition, an oral examination is taken, which relates to the content of two of the chosen three courses.

Prerequisites

Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues

This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Annotation

The content of the Basic Modul is helpful.

T 8.42 Course: In-depth Module - Spheres of Life - Self Assignment BAK [T-ZAK-112657]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate

At least two presentations must be given: An examination of another kind according to § 5 section 3 (3) in the form of a presentation in one of the chosen courses (3 ECT).
In a third seminar, either (a) a presentation is held (preliminary study achievement) which remains not graded and a topic-related term paper is submitted or (b) a written exam is taken.
The three courses can be selected individually from the 5 thematic blocks or – in exceptional cases and according to the agreement with the responsible lecturer – all three courses can be selected from one block in the sense of a specialization.
In addition, an oral examination is taken, which relates to the content of two of the chosen three courses.

Prerequisites

Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues

This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Annotation

The content of the Basic Modul is helpful.

T 8.43 Course: In-depth Module - Technology & Responsibility - Self Assignment BAK [T-ZAK-112654]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
At least two presentations must be given: An examination of another kind according to § 5 section 3 (3) in the form of a presentation in one of the chosen courses (3 ECT).
In a third seminar, either (a) a presentation is held (preliminary study achievement) which remains not graded and a topic-related term paper is submitted or (b) a written exam is taken.
The three courses can be selected individually from the 5 thematic blocks or – in exceptional cases and according to the agreement with the responsible lecturer – all three courses can be selected from one block in the sense of a specialization.
In addition, an oral examination is taken, which relates to the content of two of the chosen three courses.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Annotation
The content of the Basic Modul is helpful.

T 8.44 Course: Industrial Internship [T-MACH-112941]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106390 - Industrial Internship

Type	Credits	Grading scale	Expansion	Version
Completed coursework	12	pass/fail	1 terms	1

Exams			
WT 23/24	76T-MACH-112941	Industrial Internship	Hillenbrand

Competence Certificate
Submission of the internship documents (employment contract, internship certificate) as well as an internship report in the form of a written report (0.5 pages of text per week). The internship reports should be reviewed by the person supervising the internship in the company and must be confirmed by company stamp and signature.

Prerequisites
none

T 8.45 Course: Introduction to Computational Fluid Dynamics [T-MACH-110362]

Responsible: Prof. Dr.-Ing. Bettina Frohnapfel
Dr.-Ing. Alexander Stroh

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106382 - Mobility Systems
M-MACH-106383 - Computational Engineering

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

Events					
ST 2024	2154533	Introduction to Computational Fluid Dynamics	2 SWS	Lecture /	Stroh, Frohnapfel
Exams					
ST 2024	76-T-MACH-110362	Introduction to Computational Fluid Dynamics			Stroh

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

Competence Certificate
written 90min

Prerequisites
Passing the "Tutorial Introduction to Computational Fluid Dynamics" (T-MACH-111033) is prerequisite for taking part in the exam.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-111033 - Tutorial Introduction to Computational Fluid Dynamics must have been passed.

Annotation
Knowledge of the contents of the courses "Continuum Mechanics of Solid and Fluids" and "Mathematical Methods of Continuum Mechanics" as well as the corresponding tutorials is expected.

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

V Introduction to Computational Fluid Dynamics
2154533, SS 2024, 2 SWS, Language: German, Open in study portal

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

Content

- Introduction and Motivation, Fundamental Equations and Dimensionless Numbers
- Turblence and Modelling (DNS, LES, RANS);
- Numerical Solution of the Navier Stokes Equations:
  Discretization and Solution Approaches (FDM, FVM), boundary and initial conditions, stability, mistakes in numerics and modelling
- Set-up of a numerical simulation: pre- and postprocessing, validation, result evaluation, discussion of results
- Introduction to open-source toolbox OpenFOAM:
  set-up of simulation, generation of numerical grid with different tools, data evaluation within OpenFOAM and with python;
- Introduction to a research oriented toolbox for turbulent flows (DNS based o Incompact3d): set-up of simulation, statistical evaluation and analysis with MATLAB und python;
- visualisization of simulation results in ParaView

This course includes a lecture and a computer course.

Organizational issues
Die Kenntnis der Vorlesungsinhalte "Kontinuumsmechanik der Festkörper und Fluide" sowie "Mathematische Methoden der Kontinuumsmechanik" wird vorausgesetzt.

Literature
Wird in der Vorlesung bekannt gegeben.

T 8.46 Course: Introduction to Energy Technology [T-MACH-112959]

Responsible: Prof. Dr.-Ing. Hans-Jörg Bauer
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106385 - Sustainable Energy Technology

Type	Credits	Grading scale	Expansion	Version
Written examination	4	Grade to a third	1 terms	1

Competence Certificate
Written exam (90 min)

Prerequisites
none

T 8.47 Course: Introduction to High Temperature Materials [T-MACH-111258]

Responsible: Prof. Dr.-Ing. Bronislava Gorr
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106386 - Applied Materials

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

Events					
ST 2024	2194724	Introduction to High Temperature Materials	2 SWS	Lecture / 🗣	Gorr

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
oral examination (ca. 30 Minuten)

Prerequisites
none

Recommendation
Knowledge from the basic materials science lecture

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

V Introduction to High Temperature Materials

2194724, SS 2024, 2 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content
Oral examination (about 30 min)

Teaching content:

- Applications and requirements for high temperature materials
- High temperature corrosion (thermodynamics, oxidation kinetics, oxidation of alloys, protection of high temperature materials)
- Creep (creep curve, creep mechanisms, creep of solid-solution strengthened materials, creep of particle hardened alloys, life time prediction)
- Fatigue (fundamentals, life time prediction)
- Thermo-mechanical fatigue
- High-temperature materials (Ni-, Fe-, Co- Ti-based alloys, ODS materials)

Qualification targets:

The students acquire fundamental knowledge about high temperature corrosion, creep, high temperature fatigue and thermomechanical fatigue as well as resulting failure mechanisms.

Recommendations:

Basic course in materials science and engineering

Organizational issues
Anmeldung verbindlich bis zum 14.04.2023 unter bronislava.gorr@kit.edu

Literature

- Bürgel: Handbuch Hochtemperaturwerkstofftechnik, 3. Auflage, Vieweg, 2006
- Rösler, H. Harders, M. Bäker: Mechanisches Verhalten der Werkstoffe, 2. Auflage, Teubner, 2006
- J. Young, High temperature oxidation and corrosion of metals, Elsevier, 2008
- Skript in elektronischer Form verfügbar.

8.48 Course: Introduction to Mechanics of Fibre-Reinforced Composites [T-MACH-112976]

Responsible: Prof. Dr.-Ing. Luise Kärger
Dr.-Ing. Florian Wittemann

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106382 - Mobility Systems
M-MACH-106383 - Computational Engineering
M-MACH-106386 - Applied Materials

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

Competence Certificate
oral exam (duration approx. 20 minutes)

Prerequisites
none

Annotation
Content: Characteristics and applications of fiber-reinforced composites, continuous and discontinuous fiber reinforced polymers, modeling of fiber orientations, fiber lengths and fiber volume fractions, homogenization methods and experimental test methods to determine macroscopic mechanical properties, approaches to modeling and simulation at component level

T 8.49 Course: Introduction to the Finite Element Method [T-MACH-105320]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106382 - Mobility Systems
M-MACH-106383 - Computational Engineering

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

Events					
ST 2024	2162282	Introduction to the Finite Element Method	2 SWS	Lecture / 🗣	Langhoff, Böhlke

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
written exam (90 min)

prerequisites: passing the corresponding "Tutorial to Introduction to the Finite element method" (T-MACH-110330)

Prerequisites
Passing the "Tutorial to Introduction to the Finite element method" (T-MACH-110330) is a prerequisite for taking part in the exam.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-110330 - Tutorial Introduction to the Finite Element Method must have been passed.

Annotation
Knowledge of the contents of the courses "Continuum Mechanics of Solids and Fluids" and "Mathematical Methods of Continuum Mechanics" as well as the corresponding tutorials are expected

Due to capacity reasons it is possible that not all students of this course can be admitted to the computer tutorials. Students of the bachelor's degree program in mechanical engineering who have chosen the Major Field Continuum Mechanics (SP-Nr 13) will be admitted to the computer tutorials in any case.
If additional places are available in the computer tutorials for this course, these will be allocated according to the BSc average grade.

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

V Introduction to the Finite Element Method

2162282, SS 2024, 2 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content

- introduction and motivation, elements of tensor calculus
- Discrete FEM: systems of bars and springs
- Formulations of boundary value problems (1D)
- Approximations in FEM
- FEM for scalar and vector-valued field problems
- Solution methods for linear systems of equations

Literature

- Fish, J., Belytschko, T.: A First Course in Finite Elements, Wiley 2007
- Jung, M., Langer, U.: Methode der finiten Elemente für Ingenieure: Eine Einführung in die numerischen Grundlagen und Computersimulation, Teubner 2013
- Braess, D.: Finite Elemente -- Theorie, schnelle Löser und Anwendungen in der Elastizitätstheorie, Springer 2013
- Gustafsson, B.: Fundamentals of Scientific Computing, Springer 2011

8.50 Course: IT and Data Science [T-MACH-112925]

Responsible: Prof. Dr.-Ing. Anne Meyer
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106388 - IT and Data Science

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

Events					
ST 2024	2122370	IT and Data Science	4 SWS	Lecture / 🗣	Meyer
Exams					
ST 2024	76- T-MACH- 112925	IT and Data Science			Meyer

Legend: 🖥 Online, ✲ Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
written exam, duration 90 minutes

Prerequisites
T-MACH-112924 - *Python course on IT and Data Science* must have been passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-113408 - Python course on IT and Data Science must have been passed.

T 8.51 Course: Lab Computer-Aided Methods for Measurement and Control [T-MACH-105341]

Responsible: Marvin Klemp
Prof. Dr.-Ing. Christoph Stiller

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106384 - Intelligent Systems

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

Events					
WT 23/24	2137306	Lab Computer-aided methods for measurement and control	3 SWS	Practical course / 🗣	Stiller, Immel
Exams					
WT 23/24	76-T-MACH-105341	Lab Computer-Aided Methods for Measurement and Control			Stiller

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Colloquia

Prerequisites
none

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

V Lab Computer-aided methods for measurement and control

Practical course (P)
On-Site

2137306, WS 23/24, 3 SWS, Language: German, Open in study portal

Content
Lerninhalt (EN):

1. Digital technology
2. Digital storage oscilloscope and digital spectrum analyzer
3. Supersonic computer tomography
4. Lighting and image acquisition
5. Digital image processing
6. Image interpretation
7. Control synthesis and simulation
8. Robot: Sensors

9 Robot: Actuating elements and path planning
The lab comprises 9 experiments.

Voraussetzungen: Recommendations:

Basic studies and preliminary examination; basic lectures in automatic control

Arbeitsaufwand (EN): 120 hours

Lernziele (EN):

Powerful and cheap computation resources have led to major changes in the domain of measurement
and control. Engineers in various fields are nowadays confronted with the application of computer-aided methods. This lab tries to give an insight into the modern domain of measurement and control by means of practically oriented and flexible experiments. Based on experiments
on measurement instrumentation and digital signal processing, elementary knowledge in the domain of visual inspection and image processing will be taught. Thereby, commonly used software like MATLAB/Simulink will be used in both simulation and realization of control loops. The lab closes with selected applications, like control of a robot or supersonic computer
tomography.

Nachweis (EN):

Colloquia

Literature

Übungsanleitungen sind auf der Institutshomepage erhältlich.

Instructions to the experiments are available on the institute's website

T 8.52 Course: Machines and Processes of Energy Conversion [T-MACH-112939]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106379 - Machines and Processes of Energy Conversion

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

Competence Certificate
Written exam, duration 2 h.

Prerequisites
The coursework T-MACH-112938 Energy Conversion, Lab Course, must have been passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-112938 - Machines and Processes of Energy Conversion, Lab Course must have been passed.

T 8.53 Course: Machines and Processes of Energy Conversion, Lab Course [T-MACH-112938]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106379 - Machines and Processes of Energy Conversion

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

Competence Certificate
As coursework, a report about the Lab Course has to be prepared. Further information will be provided in the course.

Prerequisites
none

Annotation
The coursework is a prerequisite for the course T-MACH-112939 Energy Conversion.

T 8.54 Course: Material and Contact Mechanics [T-MACH-112978]

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

Part of: M-MACH-106386 - Applied Materials

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

Competence Certificate
oral exam, duration approx. 30 minutes

Prerequisites
none

T 8.55 Course: Material Flow in Production and Logistics [T-MACH-112968]

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

Part of: M-MACH-106387 - Human-Centered Product Development and Production

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

Competence Certificate
The assessment consists of an oral exam (approx. 20 min.) taking place in the recess period according to § 4 paragraph 2 Nr. 2 of the examination regulation.

Prerequisites
none

Recommendation
none

T 8.56 Course: Materials Processing Technology [T-MACH-112986]

Responsible: Dr. Joachim Binder
Dr.-Ing. Wilfried Liebig

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106386 - Applied Materials

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

Events					
WT 23/24	2173540	Materials Processing Technology	3 SWS	Lecture / Practice (/ 🗣	Liebig, Binder
Exams					
WT 23/24	76-T-MACH-100295	Materials Processing Technology			Liebig, Binder

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

Competence Certificate
oral exam, about 25 min.

Prerequisites
none

Annotation
This is for the MACH course and only includes the lecture. The lab course is not part of it.

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

V Materials Processing Technology

2173540, WS 23/24, 3 SWS, Language: German, Open in study portal

Lecture / Practice (VÜ)
On-Site

Content
Introduction

Polymers:

Raw materials, materials laws and models, rheology, moulding, forming, joining

Ceramics:

raw materials, powder synthesis, additives, moulding and forming of glass, moulding, abrasive techniques, changing properties, final processing

metals:

raw materials, materials processing, moulding, forming, cutting, joining

semiconductors:

raw materials, moulding, changing properties

Summary

objectives:

The students are able to name the different materials processing techniques and can the describe their basic principles and allocate them to the different classes of metarials processing methods.

They can chose specific processing techniques based on given problems and consider constraints derived from their basic knowledge in materials science.

The students are able to carry out simple experiments with lab scale equipment. They can correlate the processing parameters with resulting material properties by analyzing the materials using adequate testing methods which have to be chosen, evaluated and documented suitable to the problems given.

requirements:

none, **Recommendations:** Module "Basics in Materials Science" should be passed

workload:

The workload for the study program MatWerk for the lecture “materials processing technology” is 180 h per semester and consists of the presence during the lectures (36 h) including tutorials, presence during the lab course (12 h), preparation and rework time at home (72 h) and preparation time for the oral exam (60 h).

The workload for the study program Mechanical Engineering for the lecture “materials processing technology” is 120 h per semester and consists of the presence during the lectures (36 h) including tutorials, preparation and rework time at home (24 h) and preparation time for the oral exam (60 h).

Literature
Literaturhinweise, Unterlagen und Teilmanuskript in der Vorlesung

Presentation slides and additional lecture notes are handed out during the lecture, additional literature recommendations given

T 8.57 Course: Materials Science I and II [T-MACH-112926]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Prof. Dr. Astrid Pundt

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106376 - Manufacturing Technology and Materials Science

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	10	Grade to a third	Each winter term	2 terms	1

Events					
WT 23/24	2173550	Materials Science and Engineering I for mach, phys	4 SWS	Lecture / 🗣	Pundt, Kauffmann
WT 23/24	2173552	Exercises in Materials Science and Engineering I for mach, phys	1 SWS	Practice / 🗣	Pundt, Kauffmann
ST 2024	2174560	Materials Science and Engineering II for mach, phys	3 SWS	Lecture / 🗣	Heilmaier, Pundt
ST 2024	2174563	Exercises in Materials Science and Engineering II for mach, phys	1 SWS	Practice / 🗣	Heilmaier, Kauffmann
Exams					
WT 23/24	76-T-MACH-105145	Materials Science I, II			Heilmaier, Pundt

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

Competence Certificate
oral exam, duration approx. 25 minutes

Prerequisites
Prerequisite for oral exam: T-MACH-112929 Materials Science Lab Course has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-112929 - Materials Science Lab Course must have been passed.

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

V Materials Science and Engineering I for mach, phys

2173550, WS 23/24, 4 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content
Atomic structure and atomic bonds

Structures of crystalline solids

Defects in crystalline solids

Structure of amorphous and semi-crystalline solids

Alloys

Transport and transformation phenomena in the solid state

Microscopy methods

Characterization by means of X-rays, Neutrons and Electrons

Nondestructive testing of materials

Mechanical testing of materials

learning objectives:
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 profies 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.

requirements:

None, **Recommendations:** None.

workload:

regular attendance: 53 hours
self-study: 157 hours

Literature
Vorlesungsskript; Videos, Übungsaufgabenblätter.

Shackelford, J.F., Werkstofftechnologie für Ingenieure,Verlag Pearson Studium, 2005

Skolaut, W., Maschinenbau (Ein Lehrbuch für das ganze Bachelor-Studium), Springer, Heidelberg 2014

Gottstein, G., Physikalische Grundlagen der Materialkunde, 3 Aufl., Springer Verlag, Berlin, 2007

V **Exercises in Materials Science and Engineering I for mach, phys**
2173552, WS 23/24, 1 SWS, Language: German, Open in study portal

Practice (Ü)
On-Site

Content
Example exercises

learning objectives:

The students can apply the knowledge gained through the lacture as well as self-studies and transfer this knowledge to problems given.

They can carry out calculations independantly dealing with different subjects of materials science. Therefore, they are able to decide which formulas allow the calculation based on the question given.

Theyare able to discuss aspects of materials science both quantitatively and qualitatively and can present these results oraly.

requirements:
Lecture Materials Science and Engineering I

workload:

Regular attendance: 21 h, self studies: 21 h

Literature
Vorlesungsskript zu WK1

V **Materials Science and Engineering II for mach, phys**
2174560, SS 2024, 3 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content
Topics:

Ferrous materials

Non-ferrous metals and alloys

Engineering ceramics

Glasses

Polymers

Composites

Learning Objectives:

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.

Requirements:
Materials Science and Engineering I

Workload:

regular attendance: 42 hours
self-study: 108 hours

Examination:

Combined with 'Materials Science and Engineering I'; oral; about 30 minutes

The successful partcipation in the lab course is obligatory for the admission to the examination.

Organizational issues
Weitere Informationen zu dieser Veranstaltung finden Sie hier: https://www.iam.kit.edu/wk/lehre.php

Literature
Vorlesungsskript, Vorlesungsvideos, Übungsblätter, Übungsvideos

Weiterführende Informationen gibt es hier:

J. F. Shackelford: „Werkstofftechnologie für Ingenieure. Grundlagen - Prozesse - Anwendungen“, Pearson Studium (2005)
https://services.bibliothek.kit.edu/primo/start.php?recordid=KITSRC117341509

A. Rösler, H. Harders, M. Bäker: „Mechanisches Verhalten der Werkstoffe“, Springer Vieweg (2016)
http://dx.doi.org/10.1007/978-3-658-13795-3 (frei im KIT-Netz erhältlich)

G. Gottstein: „Materialwissenschaft und Werkstofftechnik: Physikalische Grundlagen“, Springer (2014)
http://dx.doi.org/10.1007/978-3-642-36603-1 (frei im KIT-Netz erhältlich)

J. Freudenberger: „Skript zur Vorlesung Physikalische Werkstoffeigenschaften“, IFW Dresden (2004)
https://www.ifw-dresden.de/de/ifw-institutes/ikm/lectures/vorlesungsskript-physikalische-werkstoffeigenschaften (frei zugänglich)

V **Exercises in Materials Science and Engineering II for mach, phys**
2174563, SS 2024, 1 SWS, Language: German, Open in study portal

Practice (Ü)
On-Site

Content

Learning Objectives:

The students can apply the knowledge gained through the lacture as well as self-studies and transfer this knowledge to problems given.

They can carry out calculations independantly dealing with different subjects of materials science. Therefore, they are able to decide which formulas allow the calculation based on the question given.

Theyare able to discuss aspects of materials science both quantitatively and qualitatively and can present these results oraly.

Requirements:
Lecture on Materials Science and Engineering II

Organizational issues
Weitere Informationen finden Sie hier: https://www.iam.kit.edu/wk/lehre.php

Literature
Vorlesungsskript, Vorlesungsvideos, Übungsblätter, Übungsvideos

Weiterführende Informationen gibt es hier:

J. F. Shackelford: „Werkstofftechnologie für Ingenieure. Grundlagen - Prozesse - Anwendungen“, Pearson Studium (2005)
https://services.bibliothek.kit.edu/primo/start.php?recordid=KITSRC117341509

G. Gottstein: „Materialwissenschaft und Werkstofftechnik: Physikalische Grundlagen“, Springer (2014)
http://dx.doi.org/10.1007/978-3-642-36603-1 (frei über die KIT-Lizenz abrufbar)

J. Freudenberger: „Skript zur Vorlesung Physikalische Werkstoffeigenschaften“, IFW Dresden (2004)
http://www.ifw-dresden.de/institutes/imw/lectures/pwe

P. Haasen: „Physikalische Metallkunde“, Cambridge University Press (2003)
http://services.bibliothek.kit.edu/primo/start.php?recordid=KITSRC309606810

R.W. Cahn, P. Haasen (Editoren): „Physical Metallurgy“, Serie, North Holland (1996)
http://services.bibliothek.kit.edu/primo/start.php?recordid=KITSRC052463656

D. A. Porter, K. Easterling: „Phase Transformation in Metals and Alloys“, Chapman & Hall (2009)
http://services.bibliothek.kit.edu/primo/start.php?recordid=KITSRC27759961X

E. Hornbogen, H. Warlimont: „Metalle: Struktur und Eigenschaften von Metallen und Legierungen“, Springer (2016)
http://dx.doi.org/10.1007/978-3-662-47952-0 (frei über die KIT-Lizenz abrufbar)

E. Hornbogen, G. Eggeler, E. Werner: „Werkstoffe: Aufbau und Eigenschaften von Keramik-, Metall-, Polymer- und Verbundwerkstoffen“, Springer (2012)
http://dx.doi.org/10.1007/978-3-642-22561-1 (frei über die KIT-Lizenz abrufbar)

H.-J. Bargel, G. Schulze: „Werkstoffkunde“, Springer (2012)
http://dx.doi.org/10.1007/978-3-642-17717-0 (frei über die KIT-Lizenz abrufbar)

J. Rösler, H. Harders, M. Bäker: „Mechanisches Verhalten der Werkstoffe“, Springer Vieweg (2016)
http://dx.doi.org/10.1007/978-3-658-13795-3 (frei über die KIT-Lizenz abrufbar)

T 8.58 Course: Materials Science Lab Course [T-MACH-112929]

Responsible: Prof. Dr. Astrid Pundt
Dr. rer. nat. Stefan Wagner

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106376 - Manufacturing Technology and Materials Science

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework (practical)	2	pass/fail	Each summer term	1 terms	1

Events					
ST 2024	2174597	Experimental Lab Course in Material Science	3 SWS	Practical course / 🗣	Wagner, Heilmaier, Pundt, Dietrich, Guth

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

Competence Certificate
The lab course consists of five topics. An oral colloquium takes place at the beginning of each topic. Once the colloquium is passed, the experiment is carried out. The course is passed after all colloquia have been passed and all experiments have been carried out.

Prerequisites
none

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

V Experimental Lab Course in Material Science

2174597, SS 2024, 3 SWS, Language: German, Open in study portal

Practical course (P)
On-Site

Content
Performing and evaluating of laboratory experiments in the following topics:

Mechanical testing of materials
Nonmetallic materials
Microstructure and properties
Cyclic loading / fatigue
Influence of manufacturing technique on materials

learning objectives:

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

The students can name standard materials characterization methods and can describe the execution of the tests as well as the evaluation of the results. The students are able to asses materials on base of the data obtained by these methods.

The students are capable to select appropriate experiments to clarify probelms regarding the materials behaviour. They can describe the experimental procedures and can carry out experiments. They can derive material properties from data gained in experiments. They can interpret these properties regarding microstructure-propety-relations.

requirements:
Materials Science and Engineering I & II
workload:

regular attendance: 22 hours
self-study: 68 hours

Organizational issues
Blockveranstaltung. Infos durch ILIAS und in der VL WK II. Anmeldung erforderlich.

Literature
Praktikumsskriptum

Shackelford, J.F.
Werkstofftechnologie für Ingenieure
Verlag Pearson Studium, 2005

T 8.59 Course: Measurement II [T-MACH-105335]

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

Part of: M-MACH-106384 - Intelligent Systems

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

Events					
ST 2024	2138326	Measurement II	2 SWS	Lecture / 🗣	Stiller, Steiner
Exams					
WT 23/24	76-T-MACH-105335	Measurement II			Stiller

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
written exam

60 min.

2 DIN A4 Self-created formular sheets allowed

Prerequisites
none

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

V Measurement II
2138326, SS 2024, 2 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content
Lerninhalt (EN)

1. Amplifiers
2. Digital technology
3. Stochastic modeling for measurement applications
4. Estimation
5. Kalman Filter
6. Environmental perception

Lernziele (EN):

The capabilities of modern sensor technology pave the way for novel applications in engineering. Especially digital measurement techniques may be used even in very complex environments and thus have strong impact on technological progress. Stochastic models of measurement processes form the basis for meaningful information processing and provide a valuable tool for engineering. This interdisciplinary lecture addresses students in mechanical engineering and related subjects. The lecture gives an overview of digital technology and stochastics. These areas form the basis of estimation methods that can be embedded elegantly in the theory of state observers. Applications in signal processing for modern environmental perception (video, Lidar, Radar) illustrate the discussed subjects.

Nachweis:

Written exam

60 minutes

Individual sheet of formulas

Arbeitsaufwand:

120 hours

Literature
Skript und Foliensatz zur Veranstaltung werden als kostenlose pdf-Dateien bereitgestellt. Weitere Empfehlungen werden in der Vorlesung bekannt gegeben.

Idealerweise haben Sie zuvor 'Grundlagen der Mess- und Regelungstechnik' gehört oder verfügen aus einer Vorlesung anderer Fakultäten über grundlegende Kenntnisse der Mess- und Regelungstechnik und der Systemtheorie.

T 8.60 Course: Measurement Technology, Data Transmission and Data Analysis in Energy Technology [T-MACH-112961]

Responsible: Prof. Dr. Thomas Koch
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106385 - Sustainable Energy Technology

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

Competence Certificate
Oral exam, duration approx. 20 minutes

Prerequisites
none

T 8.61 Course: Mechanical Design A [T-MACH-112984]

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

Part of: M-MACH-106375 - Mechanical Design

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

Events					
WT 23/24	2145170	Mechanical Design A	3 SWS	Lecture / Practice (	Matthiesen, Düser
Exams					
WT 23/24	76T-MACH-112984	Mechanical Design A			Matthiesen, Düser
ST 2024	76T-MACH-112984	Mechanical Design A			Matthiesen, Düser

Competence Certificate
Written exam with a duration of 90 Minutes

Prerequisites
Admission to the exam only with succesful completion of Workshop Mechanical Design A (T-MACH-112981)

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-112981 - Mechanical Design A, Workshop must have been passed.

Recommendation
None

Annotation
Students are familiar with the basic machine elements of technical systems and are able to analyze them in a system context

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

V Mechanical Design A

2145170, WS 23/24, 3 SWS, Language: German, Open in study portal

Lecture / Practice (VÜ)

Content
Students are introduced to fundamental topics in Mechanical Design A. The focus is on the analysis of existing systems and the development of knowledge for fundamental elements and functionality of technical systems. The course is divided into the following topics:

- Springs
- Technical systems
- Bearings
- Seals
- Component connection
- Gearbox

Literature

- Grundlagen der Berechnung und Gestaltung von Maschinenelementen; Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X oder Volltextzugriff über Uni-Katalog der Universitätsbibliothek
- Grundlagen von Maschinenelementen für Antriebsaufgaben; Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

T 8.62 Course: Mechanical Design A, Workshop [T-MACH-112981]

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

Part of: M-MACH-106375 - Mechanical Design

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each winter term	1 terms	2

Events					
WT 23/24	2145171	Mechanical Design A - Workshop	1 SWS	Practical course / 🗣	Düser, Matthiesen
Exams					
WT 23/24	76-T-MACH-112981	Mechanical Design A, Workshop			Düser, Matthiesen

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

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

Recommendation
None

Annotation
None

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

V Mechanical Design A - Workshop

2145171, WS 23/24, 1 SWS, Language: German, Open in study portal

Practical course (P)
On-Site

Content
In addition to the MD A lecture, the students are familiarized with the design process in a series of three workshops. The focus here is on application-oriented learning and understanding. For example, the students independently disassemble and assemble small demonstrator systems and thus gain a better understanding of the relevant problems in the field of mechanical design.

Literature

- Grundlagen der Berechnung und Gestaltung von Maschinenelementen; Steinhilper, Sauer, Springer Verlag, ISBN 3-540-22033-X oder Volltextzugriff über Uni-Katalog der Universitätsbibliothek
- Grundlagen von Maschinenelementen für Antriebsaufgaben; Steinhilper, Sauer, Springer Verlag, ISBN 3-540-29629-8

T 8.63 Course: Mechanical Design B and C [T-MACH-112985]

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

Part of: M-MACH-106375 - Mechanical Design

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

Events					
ST 2024	2146200	Mechanical Design B	2 SWS	Lecture / 🗣	Matthiesen, Düser
ST 2024	2146201	Exercises for Mechanical Design B	1 SWS	Practice / 🗣	Matthiesen, Düser

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Written exam consisting of a written & design part (total 240 minutes)

Prerequisites
Admission to the exam only with succesful completion of Workshop Mechanical Design B (T-MACH-112982) AND Workshop Mechanical Design C (T-MACH-112983)

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-112983 - Mechanical Design C, Workshop must have been passed.
2. The course T-MACH-112982 - Mechanical Design B, Workshop must have been passed.

Recommendation
None

Annotation
None

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

V Mechanical Design B

2146200, SS 2024, 2 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content
Students are introduced to advanced topics in machine design theory. The focus here is on tools for the synthesis of technical systems and the in-depth development of knowledge for the functioning of technical drive train systems. The course is divided into the following thematic blocks:

- Design
- Tolerances and fits
- Gear drives
- Clutches and brakes

Qualification Goals
Building on the knowledge and skills acquired in the lecture Machine Design Theory A, the lecture Machine Design Theory B aims to provide students with the ability to synthesize acquired knowledge about structure and function into concepts for technical systems, with a focus on the drive train.

Students will be able to

- apply the basic rules and procedures in product design.
- recognize the requirements of various disciplines for product design and, in particular, take into account the requirements of product safety, economic efficiency and manufacturing processes in the design of new products
- understand the function and necessity of tolerances in design and consider suitable tolerances and fits in their designs
- understand the structure and function of gear transmissions as well as clutches and brakes, select suitable components for specific contexts and integrate these into their own designs, taking critical operating conditions into account

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

V **Exercises for Mechanical Design B**
2146201, SS 2024, 1 SWS, Language: German, Open in study portal

Practice (Ü)
On-Site

Content
Practical applications and tasks in the subject areas of MKL B:

- Design
- Tolerances and fits
- Gear drives
- Clutches and brakes

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

T 8.64 Course: Mechanical Design B, Workshop [T-MACH-112982]

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

Part of: M-MACH-106375 - Mechanical Design

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	3	pass/fail	Each summer term	1 terms	1

Events					
ST 2024	2146202	Workshop of Mechanical Design B	1,5 SWS	Practical course / 🗣	Matthiesen, Düser

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

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.

A CAD task from the area of mechanical design must be processed. This will be approved within an examination.

The pass of the colloquia and the process of the workshop task are required for the successful participation.

Prerequisites
None

Recommendation
None

Annotation
None

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

V Workshop of Mechanical Design B
2146202, SS 2024, 1,5 SWS, Language: German, Open in study portal

Practical course (P)
On-Site

Content
Solving a design task in a team using typical engineering tools. Processing a CAD task and approving the results in workshop sessions.

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 8.65 Course: Mechanical Design C, Workshop [T-MACH-112983]

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

Part of: M-MACH-106375 - Mechanical Design

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	3	pass/fail	Each winter term	1 terms	1

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.

A CAD task from the area of mechanical design must be processed. This will be approved within an examination.

The pass of the colloquia and the process of the workshop task are required for the successful participation.

Prerequisites
None

Recommendation
None

Annotation
None

T 8.66 Course: Mechatronical Systems and Products [T-MACH-112988]

Responsible: Prof. Dr.-Ing. Sören Hohmann
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106384 - Intelligent Systems
M-MACH-106387 - Human-Centered Product Development and Production

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

Competence Certificate
written exam (duration 60 minutes)

Prerequisites
none

Recommendation
Mechanical Design should be completed

Annotation
All relevant contents (script, exercise sheets, etc.) for the course can be obtained via the eLearning platform ILIAS. To participate in the course, please complete the survey registration and group assignment in ILIAS already before the start of the semester.

T 8.67 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-106386 - Applied Materials

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

Events					
WT 23/24	2183702	Modelling of Microstructures	3 SWS	Lecture / Practice (/	August, Prahs, Nestler
Exams					
WT 23/24	76-T-MACH-105303	Modelling of Microstructures			August, Weygand, Nestler
ST 2024	76-T-MACH-105303	Modelling of Microstructures			August, Nestler, Weygand

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

Competence Certificate
oral exam 30 min

Prerequisites
none

Recommendation
materials science
fundamental mathematics

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

V Modelling of Microstructures

2183702, WS 23/24, 3 SWS, Language: German, Open in study portal

Lecture / Practice (VÜ)
On-Site

Content

- Brief Introduction in thermodynamics
- Gibbs free energy and phase diagrams
- Free energy functional
- Phasefield equation
- Driving forces
- Grand chemical potential functional and the evolution equations
- Numeric solution of the phasefield equation

The student can

- explain the thermodynamic and statistical foundations for liquid-solid and solid-solid phase transition processes and apply them to construct phase diagrams.
- explain the mechanisms of phase boundary motion induced under driving forces
- use the phase-field method for simulation of microstructure formation processes
- have experiences in computing and conduction simulations of microstructure formation from an integrated computer lab.

Knowledge in materials science and in fundamental mathematics recommended

regular attendance: 22,5 hours lecture, 11,5 hours exercises
self-study: 116 hours

oral exam ca. 30 min

Organizational issues

Der erste Termin (am 27.10.2023) findet ausnahmsweise ohne die Dozentin statt. Bitte schauen Sie sich an diesem Termin die erste Aufzeichnung der Vorlesung an (s. das entsprechende Verzeichnis bei ILIAS).

Terminvereinbarung für die mündliche Prüfung: Sobald Sie wissen, wann Sie die Prüfung ablegen möchten, schreiben Sie bitte eine Mail an die Prüferin Anastasia August (anastasia.august2@kit.de) und schlagen Sie einen oder mehrere Termin/e vor. Die Prüfung dauert ca. 30 Minuten.

Literature

1. Gottstein, G. (2007) Physikalische Grundlagen der Materialkunde. Springer Verlag Berlin Heidelberg
2. Kurz, W. and Fischer, D. (1998) Fundamentals of Solidification. Trans Tech Publications ltd, Switzerland Germany UK USA
3. Porter, D.A. Eastering, K.E. and Sherif, M.Y. (2009) Phase transformation in metals and alloys (third edition). CRC Press, Taylor & Francis Group, Boca Raton, London, New York
4. Gaskell, D.R., Introduction to the thermodynamics of materials

T 8.68 Course: Oral Exam - Supplementary Studies on Culture and Society [T-ZAK-112659]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Oral examination	4	Grade to a third	1

Competence Certificate
An oral examination according to § 7 section 6 of approx. 45 minutes on the contents of two courses from In-depth Module.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

T 8.69 Course: Oral Exam - Supplementary Studies on Sustainable Development [T-ZAK-112351]

Organisation:

Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Oral examination	4	Grade to a third	1

Competence Certificate
An oral examination according to § 7 section 6 of approx. 45 minutes on the contents of two courses from Elective Module.

Prerequisites
A requirement for the Supplementary Course: Oral examination is the successful completion of the modules Basics Module and Specialisation Module and the required electives of Elective Module.

T 8.70 Course: Participation in Empirical Research [T-MACH-112935]

Responsible: Prof. Dr.-Ing. Barbara Deml
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106389 - Key Competences

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each winter term	1 terms	1

Competence Certificate
The students participate as test subjects, spread over one or more semesters, in various empirical studies (e.g. laboratory experiments, questionnaire studies) of the KIT with a total of at least ten hours. Students are free to take studies from all faculties (e.g. mechanical engineering, sports science, industrial engineering, business informatics, see selected list on ifab-homepage). Participation and the scope (total of at least 10 hours) are confirmed on a form by the respective study leader and finally checked by the person responsible for the module and confirmed as academic achievement.

Prerequisites
none

T 8.71 Course: Physical Foundation of Modern Measurement Methods [T-MACH-112980]

Responsible: Prof. Dr. Martin Dienwiebel
Dr. Daniel Weygand

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106386 - Applied Materials

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

Competence Certificate
Written exam, duration 90 minutes

Prerequisites
none

T 8.72 Course: Powertrain Systems Technology A: Automotive Systems [T-MACH-105233]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106382 - Mobility Systems
M-MACH-106387 - Human-Centered Product Development and Production

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

Events					
ST 2024	2146180	Powertrain Systems Technology A: Automotive Systems	2 SWS	Lecture / 🗣	Albers, Düser, Ott
Exams					
WT 23/24	76-T-MACH-105233	Powertrain Systems Technology A: Automotive Systems			Albers, Ott
ST 2024	76-T-MACH-105233	Powertrain Systems Technology A: Automotive Systems			Albers, Ott

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, × Cancelled

Competence Certificate
written examination: 60 min duration

Prerequisites
None

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

V Powertrain Systems Technology A: Automotive Systems

Lecture (V)
On-Site

2146180, SS 2024, 2 SWS, Language: German, Open in study portal

Content
Content

Students acquire the basic skills needed to develop future energy-efficient and at the same time comfortably drivable powertrains. This includes holistic development methods and evaluations of powertrain systems. The main topics can be divided into the following chapters:

- Powertrain System
- Driver System
- Environment System
- System Components
- Development Process

Recommendations for additional courses:

- Power Train Systems Technology B: Stationary Machinery

Literature
Kirchner, E.; "Leistungsübertragung in Fahrzeuggetrieben: Grundlagen der Auslegung, Entwicklung und Validierung von Fahrzeuggetrieben und deren Komponenten", Springer Verlag Berlin Heidelberg 2007

Naunheimer, H.; "Fahrzeuggetriebe: Grundlagen, Auswahl, Auslegung und Konstruktion", Springer Verlag Berlin Heidelberg 2007

T 8.73 Course: Practice Module [T-ZAK-112660]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Completed coursework	4	pass/fail	1

Competence Certificate
Internship (3 ECT)
Report within the framework of the practical training (Length approx. 18,000 characters (incl. spaces) (1 ECT)

Prerequisites
none

Annotation
Knowledge from the Basic Module and the Elective Module is helpful.

T 8.74 Course: Presentation [T-MACH-113044]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106422 - Bachelor's Thesis

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	3	pass/fail	Each term	1

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

Prerequisites
Bachelor Thesis has been started

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-113045 - Bachelor's Thesis must have been started.

Annotation
The workload for the presentation of the bachelor thesis is about 90 hours.

T 8.75 Course: Product, Process and Resource Integration in the Automotive Industry [T-MACH-102155]

Responsible: Prof. Dr.-Ing. Sama Mbang
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106382 - Mobility Systems

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

Events					
ST 2024	2123364	Product, Process and Resource Integration in the Automotive Industry	2 SWS	Lecture / Practice (/ 🗣	Mbang
Exams					
WT 23/24	76-T-MACH-102155	Product, Process and Resource Integration in the Automotive Industry			Mbang

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Oral examination 20 min.

Prerequisites
None

Annotation
Limited number of participants.

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

V Product, Process and Resource Integration in the Automotive Industry

Lecture / Practice (VÜ)
On-Site

2123364, SS 2024, 2 SWS, Language: German, Open in study portal

Content

- Overview of product development in the automotive sector (process- and work cycle, IT-Systems)
- Integrated product models in the automotive industry (product, process and resource)
- New CAx modeling methods (intelligent feature technology, templates & functional modeling)
- Automation and knowledge-based mechanism for product design and production planning
- Product development in accordance with defined process and requirement (3D-master principle, tolerance models)
- Concurrent Engineering, shared working
- Enhanced concepts: the digital and virtual factory (application of virtual technologies and methods in the product development)

Organizational issues
Blockveranstaltung

Literature
Vorlesungsfolien

T 8.76 Course: Production Techniques Laboratory [T-MACH-112995]

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-106387 - Human-Centered Product Development and Production

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

Competence Certificate
Active participation in lab course and succesful completion of colloquia before each course. The colloquia are graded.

Prerequisites
The course is limited in capacity, therefore the allocation of places is based on § 5 (4) in the Study and Examination Regulations

This results in the following selection criteria:

The selection is based

- on the study progress (here the study progress in credit points and not the study progress in semesters is taken as a basis),
- on the waiting period in the case of equal progress in studies
- by lot if the waiting period is the same.

The procedure is explained in more detail on ILIAS.

Successful participation requires active and continuous participation in the course.

T 8.77 Course: Production Technology for E-Mobility [T-MACH-112969]

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

Part of: M-MACH-106382 - Mobility Systems
M-MACH-106387 - Human-Centered Product Development and Production

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

Competence Certificate
written exam, duration 60 minutes

Prerequisites
none

T 8.78 Course: Project [T-MACH-112940]

Responsible: Prof. Dr.-Ing. Martin Heilmaier
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106381 - Project

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	5	pass/fail	Each term	1 terms	1

Competence Certificate
Presentation of the project results, written elaboration of the project results, written reflection. Students are provided with two documents with instructions on how to prepare the written documents (instructions on the report on the project results, guiding questions on the reflection report).

Recommendation
Successful completion of the course *Scientific Work and Empirical Research Methods* (Interdisciplinary Qualifications).

T 8.79 Course: Python course on IT and Data Science [T-MACH-113408]

Responsible: Prof. Dr.-Ing. Anne Meyer
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106388 - IT and Data Science

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

Events					
ST 2024	2122372	Python course on IT and Data Science	1 SWS	Block / 🗣	Meyer
Exams					
ST 2024	76-T-MACH-113408	Python course on IT and Data Science (Prerequisites)			Meyer

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

Competence Certificate
Successful participation in a colloquium in individual performance at the end of the Python course.

Successful completion of the coursework is a prerequisite for participation in the written exam (T-MACH-112925 - IT and Data Science).

Prerequisites
none

T 8.80 Course: Scientific Work and Empirical Research Methods [T-MACH-112930]

Responsible: Prof. Dr.-Ing. Barbara Deml
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106389 - Key Competences

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each summer term	1 terms	1

Competence Certificate
Ungraded written exam (pass/fail), duration 60 minutes. The written exam can be repeated as often as necessary until it is passed.

Prerequisites
none

T 8.81 Course: Self-Booking-BSc-HOC-SPZ-Graded [T-MACH-112931]

Responsible: Prof. Dr.-Ing. Barbara Deml
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106389 - Key Competences

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	2	Grade to a third	Each term	1 terms	1

Competence Certificate
Completed coursework

Prerequisites
None

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- House of Competence
- Sprachenzentrum

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

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

T 8.82 Course: Self-Booking-BSc-HOC-SPZ-Non-Graded [T-MACH-112936]

Responsible: Prof. Dr.-Ing. Barbara Deml
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106389 - Key Competences

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each term	1 terms	1

Competence Certificate
Completed coursework

Prerequisites
None

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- House of Competence
- Sprachenzentrum

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

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

T 8.83 Course: Smart Factory [T-MACH-112972]

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

Part of: M-MACH-106382 - Mobility Systems
M-MACH-106384 - Intelligent Systems
M-MACH-106387 - Human-Centered Product Development and Production

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

Competence Certificate
A maximum of 100 points can be earned. More information about the conversion of points to grades will be distributed in the first lecture.

The achievement consists of

- two oral tests during the seminar, duration approx. 20 minutes each, maximum 20 points each,
- interaction between the participants, maximum 15 points,
- scientific colloquium in groups of 3 students each, duration approx. 30 min, maximum 45 points.

Prerequisites
none

Annotation
Limited to 20 students, places allocated by lottery, registration for the lottery in the Wiwi-Portal, further information on registration on the institute's website.

T 8.84 Course: Specialisation Module - Self Assignment BeNe [T-ZAK-112346]

Responsible: Christine Myglas
Organisation:
Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Examination of another type	6	Grade to a third	1

Competence Certificate
The monitoring occurs in the form of several supplementary courses, which usually comprise a presentation of the (group) project, a written elaboration of the (group) project as well as an individual term paper, if necessary with appendices (examination performances of other kind according to statutes § 5 section 3 No. 3 or § 7 section 7).

The presentation is usually with the accompanying practice partners, as well as the written paper.

Prerequisites
Active participation in all three mandatory components.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation
Knowledge from 'Basic Module ' and 'Elective Module ' is helpful.

T 8.85 Course: Surface Technology [T-MACH-112979]

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

Part of: M-MACH-106382 - Mobility Systems
M-MACH-106386 - Applied Materials

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

Competence Certificate
oral examination (30 min)

no tools or reference materials

Prerequisites
no specific requirements

Recommendation
preliminary knowlegde in mathematics, physics and materials science

T 8.86 Course: Sustainable Production Economics [T-MACH-111859]

Responsible: Prof. Dr.-Ing. Kai Furmans
Prof. Dr.-Ing. Gisela Lanza

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-105902 - Sustainable Production Economics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	5	Grade to a third	Each winter term	1 terms	2

Events					
WT 23/24	2149616	Sustainable Production Economics	4 SWS	Lecture / Practice (/ 🗣	Lanza
Exams					
WT 23/24	76-T-MACH-111859	Sustainable Production Economics			Furmans, Lanza

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
written exam (duration: 90 min)

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

V Sustainable Production Economics

2149616, WS 23/24, 4 SWS, Language: German, Open in study portal

Lecture / Practice (VÜ)
On-Site

Content
The lecture conveys an overall understanding of operational production management with special consideration of aspects of sustainability as well as an application-oriented understanding of the fundamental issues and methods in industrial companies. Through exercises as well as a business game synchronous to the lecture, the taught contents are deepened through application, so that the participants can apply them directly in their later professional environment.

Learning Outcomes:

After successful completion of the course, the students are able …

- to discuss, alone and in a team, the terms, contexts and models by which manufacturing companies are described;
- to discuss typical problems of manufacturing companies, especially against the background of current and future challenges of ecological, social and economic sustainability;
- to apply the most important methods for efficient and sustainable management in industrial enterprises, in particular in the sense of the circular economy, in a problem-related manner;
- to select and justify decision-making alternatives by applying the methods learned;
- to critically question the methods learned and to independently acquire methods that go beyond this.

Workload:

regular attendance: 42 hours
self-study: 108 hours

Organizational issues
Vorlesungstermine montags, Übungstermine freitags.
Bekanntgabe der konkreten Übungstermine erfolgt in der ersten Vorlesung

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

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

T 8.87 Course: Sustainable Vehicle Drivetrains [T-MACH-111578]

Responsible: Prof. Dr. Thomas Koch
Dr.-Ing. Olaf Toedter
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106382 - Mobility Systems

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

Events					
WT 23/24	2133132	Sustainable Vehicle Drivetrains	2 SWS	Lecture / 🗣	Toedter
Exams					
WT 23/24	76-T-MACH-105655	Sustainable Vehicle Drivetrains			Toedter

Legend: 📱 Online, ✥ Blended (On-Site/Online), 🗣 On-Site, × Cancelled

Competence Certificate
oral exam (approx. 20 minutes)

Prerequisites
none

Annotation
Starting in winter term 25/26, the course consists of a lecture (2h / week) and a tutorial (1 h / week).

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

V Sustainable Vehicle Drivetrains
2133132, WS 23/24, 2 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content
Sustainability

Environmental balance

Legislation

Alternative fuels

BEV

Fuel cell

Hybrid drives

T 8.88 Course: Systematic Materials Selection [T-MACH-100531]

Responsible: Dr.-Ing. Stefan Dietrich
Prof. Dr.-Ing. Volker Schulze

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106386 - Applied Materials

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	5

Events					
ST 2024	2174576	Systematic Materials Selection	3 SWS	Lecture / 🗣	Dietrich
ST 2024	2174577	Excercises in Systematic Materials Selection	1 SWS	Practice / 🗣	Dietrich
Exams					
WT 23/24	76-T-MACH-100531	Systematic Materials Selection			Dietrich
ST 2024	76-T-MACH-100531	Systematic Materials Selection			Dietrich

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, × Cancelled

Competence Certificate
The assessment is carried out as a written exam of 2 h.

Prerequisites
The exam that belongs to T-MACH-112926 - Materials Science I and II must be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-112926 - Materials Science I and II must have been passed.

Recommendation
Basic knowledge in materials science, mechanics and mechanical design due to the lecture Materials Science I/II.

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

V Systematic Materials Selection

2174576, SS 2024, 3 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content
Important aspects and criteria of materials selection are examined and guidelines for a systematic approach to materials selection are 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).

Literature
Vorlesungsskriptum; Übungsblätter; Lehrbuch: M.F. Ashby, A. Wanner (Hrsg.), C. Fleck (Hrsg.);
Materials Selection in Mechanical Design: Das Original mit Übersetzungshilfen
Easy-Reading-Ausgabe, 3. Aufl., Spektrum Akademischer Verlag, 2006
ISBN: 3-8274-1762-7

Lecture notes; Problem sheets; Textbook: M.F. Ashby, A. Wanner (Hrsg.), C. Fleck (Hrsg.);
Materials Selection in Mechanical Design: Das Original mit Übersetzungshilfen
Easy-Reading-Ausgabe, 3. Aufl., Spektrum Akademischer Verlag, 2006
ISBN: 3-8274-1762-7

T 8.89 Course: Teamwork - Understanding Teams and Working Together Successfully! [T-ZAK-113076]

Organisation:

Part of: M-MACH-106389 - Key Competences

Type	Credits	Grading scale	Version
Completed coursework	2	pass/fail	1

Events					
WT 23/24	1130183	Teamwork. Understanding teams and working together successfully	2 SWS	Seminar / 🗣	Schwarz

Legend: 🖥 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale

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

V Teamwork. Understanding teams and working together successfully

Seminar (S)
On-Site

1130183, WS 23/24, 2 SWS, Language: German, Open in study portal

Content
This seminar is held in German. For additional information please visit the website in German.

T 8.90 Course: Technical Thermodynamics and Heat Transfer I [T-MACH-112912]

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

Part of: M-MACH-106377 - Technical Thermodynamics

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

Competence Certificate
Written exam; approx. 3hours

Prerequisites
Successful participation in the tutorial (T-MACH-112910 - Tutorial Technical Thermodynamics and Heat Transfer I)

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-112910 - Tutorial Technical Thermodynamics and Heat Transfer I must have been passed.

Annotation
It will be offered for the first time in the winter semester of 2024/2025.

T 8.91 Course: Technical Thermodynamics and Heat Transfer II [T-MACH-112913]

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

Part of: M-MACH-106377 - Technical Thermodynamics

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

Competence Certificate
Written exam; approx. 3hours

Prerequisites
Successful participation in the tutorial (T-MACH-112911 - Tutorial Technical Thermodynamics and Heat Transfer II)

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MACH-112911 - Tutorial Technical Thermodynamics and Heat Transfer II must have been passed.

Annotation
It will be offered for the first time in the summer semester of 2025.

8.92 Course: Thermochemical Energy Conversion and Energy Storage [T-MACH-112962]

Responsible: Prof. Dr. Ulrich Maas
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106385 - Sustainable Energy Technology

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

Competence Certificate
Written exam, duration 120 minutes

Prerequisites
none

T 8.93 Course: Transportation Systems [T-BGU-113007]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-MACH-106382 - Mobility Systems

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

Events					
ST 2024	6200406	Transportation Systems	2 SWS	Lecture / 🗣	Vortisch
ST 2024	6200407	Exercises to Transportation Systems		Practice / 🗣	Vortisch, Mitarbeiter/ innen

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Written exam with 60 min.

Prerequisites
None

Recommendation
None

Annotation
None

T 8.94 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	Grading scale	Recurrence	Version
Completed coursework (written)	0	pass/fail	Each winter term	2

Events					
WT 23/24	0131100	Übungen zu 0131000	2 SWS	Practice	Hettlich
WT 23/24	0131300	Übungen zu 0131200	2 SWS	Practice	Hettlich
Exams					
WT 23/24	6700005	Problem Class for Advanced Mathematics I			Arens, Griesmaier, Hettlich

Competence Certificate
Learning assessment is carried out by written assigments (pre-requesite). Exact requirements will be communicated in the lectures.

Prerequisites
None.

T 8.95 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	Grading scale	Recurrence	Version
Completed coursework (written)	0	pass/fail	Each summer term	2

Events					
ST 2024	0180900	Übungen zu 0180800	2 SWS	Practice	Arens
ST 2024	0181100	Übungen zu 0181000	2 SWS	Practice	Arens

Competence Certificate
Learning assessment is carried out by written assigments (pre-requesite). Exact requirements will be communicated in the lectures.

Prerequisites
None.

8.96 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	Grading scale	Recurrence	Version
Completed coursework (written)	0	pass/fail	Each winter term	2

Events					
WT 23/24	0131500	Übungen zu 0131400	2 SWS	Practice	Arens
Exams					
WT 23/24	6700006	Tutorial Advanced Mathematics III			Arens, Griesmaier, Hettlich

Competence Certificate
Learning assessment is carried out by written assigments (pre-requesite). Exact requirements will be communicated in the lectures.

Prerequisites
None.

T 8.97 Course: Tutorial Basics of Mechatronics [T-MACH-113008]

Responsible: Prof. Dr.-Ing. Alexander Fidlin
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106380 - Electrical Engineering and Mechatronics

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

Competence Certificate
Passing this course allows to register to the exam "Basics of Mechatronics" (see T-MACH-112937).

Prerequisites
None

T 8.98 Course: Tutorial Computational Continuum Mechanics [T-MACH-112996]

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

Part of: M-MACH-106383 - Computational Engineering

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

Competence Certificate
Successful solution of the homework sheets. Details are announced during the first lecture "Computational Continuum Mechanics".

Prerequisites
none

T 8.99 Course: Tutorial Continuum Mechanics of Solids and Fluids [T-MACH-110333]

Responsible: Prof. Dr.-Ing. Thomas Böhlke
Prof. Dr.-Ing. Bettina Frohnapfel

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106383 - Computational Engineering
M-MACH-106386 - Applied Materials

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

Events					
WT 23/24	2161253	Tutorial Continuum mechanics of solids and fluids	1 SWS	Practice / 🗣	Dyck, Karl, Böhlke
Exams					
WT 23/24	76-T-MACH-110333	Tutorial Continuum Mechanics of solids and fluids			Böhlke, Frohnapfel

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Successfully passing the Tutorial is a prerequisite for taking part in the exam "Continuum Mechanics of Solids and Fluids" (T-MACH-110377).

For students of Mechanical Engineering (BSc) that have chosen the Major Field "Continuum Mechanics" and for students of Material Science and Material Technology (BSc) the prerequisites consist of successfully solving the written homework sheets as well as the computational homework sheets during the associated computer tutorials.

For students of Mechanical Engineering that have chosen a different Major Field of students from different fields of study the prerequisites consist of successfully solving only the written homework sheets.

Prerequisites
None

Annotation
Due to capacity reasons it is possible that not all students of this course can be admitted to the computer tutorials. Students of the bachelor's degree program in mechanical engineering who have chosen the Major Field Continuum Mechanics (SP-Nr 13) and students of the bachelor's degree program in material science and material technology will be admitted to the computer tutorials in any case.
If additional places are available in the computer tutorials for this course, these will be allocated according to the BSc average grade.

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

V Tutorial Continuum mechanics of solids and fluids

2161253, WS 23/24, 1 SWS, Language: German, Open in study portal

Practice (Ü)
On-Site

Content
Please refer to the lecture "Continuum mechanics of solids and fluids".

Literature
Siehe Vorlesung " Kontinuumsmechanik der Festkörper und Fluide ".

Please refer to the lecture "Continuum mechanics of solids and fluids".

T 8.100 Course: Tutorial Engineering Mechanics I [T-MACH-112907]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106374 - Engineering Mechanics

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

Events					
WT 23/24	2161246	Tutorial Engineering Mechanics I	2 SWS	Practice / 🗣	Kehrer, Klein, Böhlke
Exams					
WT 23/24	76-T-MACH-100528	Tutorial Engineering Mechanics I			Böhlke, Langhoff

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Successful solution of worksheets. Details are given in the first lecture "Engineering Mechanics I"

Passing this course allows to register to the exam "Engineering Mechanics I" (see T-MACH-112904).

Prerequisites
none

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

V Tutorial Engineering Mechanics I

2161246, WS 23/24, 2 SWS, Language: German, Open in study portal

Practice (Ü)
On-Site

Content
Please refer to the lecture Engineering Mechanics I.

Literature
Siehe Vorlesung Technische Mechanik I

T 8.101 Course: Tutorial Engineering Mechanics II [T-MACH-112908]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106374 - Engineering Mechanics

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

Events					
ST 2024	2162251	Tutorial Engineering Mechanics II	2 SWS	Practice / 🗣	Kehrer, Klein, Böhlke

Legend: 🖥 Online, ♻ Blended (On-Site/Online), 🗣 On-Site, × Cancelled

Competence Certificate
Successful solution of worksheets. Details are given in the first lecture "Engineering Mechanics II"

Passing this course allows to register to the exam "Engineering Mechanics II" (see T-MACH-112905).

Prerequisites
none

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

V Tutorial Engineering Mechanics II

2162251, SS 2024, 2 SWS, Language: German, Open in study portal

Practice (Ü)
On-Site

Content
see lecture Engineering Mechanics II

Literature
Siehe Vorlesung Technische Mechanik II

T 8.102 Course: Tutorial Engineering Mechanics III [T-MACH-112909]

Responsible: N.N.
Prof. Dr.-Ing. Carsten Proppe

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106374 - Engineering Mechanics

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

Competence Certificate
Passing this course allows to register to the exam "Engineering Mechanics III" (see T-MACH-112906).

Prerequisites
none

T 8.103 Course: Tutorial Introduction to Computational Fluid Dynamics [T-MACH-111033]

Responsible: Prof. Dr.-Ing. Bettina Frohnapfel
Dr.-Ing. Alexander Stroh

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106382 - Mobility Systems
M-MACH-106383 - Computational Engineering

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

Events					
ST 2024	2154534	Tutorial Introduction to Computational Fluid Dynamics	2 SWS	Practice / Blended (On-Site/Online)	Stroh, Frohnapfel
Exams					
ST 2024	76-T-MACH-111033	Tutorial Introduction to Computational Fluid Dynamics			Stroh

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

Competence Certificate
The competence certificate consists of successfully solving the computational homework tasks.

Prerequisites
none

Annotation
Successful participation in this course allows for registration to the Exam: "Introduction to Computational Fluid Dynamics" (see T-MACH-110362).

Knowledge of the contents of the courses "Continuum Mechanics of Solids and Fluids" and "Mathematical Methods of Continuum Mechanics" as well as the corresponding tutorials is expected.

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

V Tutorial Introduction to Computational Fluid Dynamics

2154534, SS 2024, 2 SWS, Language: German, Open in study portal

Practice (Ü)
Blended (On-Site/Online)

Content

- Introduction and Motivation, Fundamental Equations and Dimensionless Numbers
- Turblence and Modelling (DNS, LES, RANS);
- Numerical Solution of the Navier Stokes Equations:
  Discretization and Solution Approaches (FDM, FVM), boundary and initial conditions, stability, mistakes in numerics and modelling
- Set-up of a numerical simulation: pre- and postprocessing, validation, result evaluation, discussion of results
- Introduction to open-source toolbox OpenFOAM:
  set-up of simulation, generation of numerical grid with different tools, data evaluation within OpenFOAM and with python;
- Introduction to a research oriented toolbox for turbulent flows (DNS based o Incompact3d): set-up of simulation, statistical evaluation and analysis with MATLAB und python;
- visualisization of simulation results in ParaView

This course includes a lecture and a computer course. The limited places in the computer course will be distributed by the institute.

T 8.104 Course: Tutorial Introduction to the Finite Element Method [T-MACH-110330]

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

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106382 - Mobility Systems
M-MACH-106383 - Computational Engineering

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

Events					
ST 2024	2162257	Tutorial Introduction to the Finite Element Method	1 SWS	Practice / 🗣	Lauff, Langhoff, Böhlke, Klein

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

Competence Certificate

Successful participation in this course allows for registration to the Exam "Introduction to the Finite Element Method" (see 76-T-MACH-105320)

For students of Mechanical Engineering (BSc) that have chosen the Major Field "Continuum Mechanics" the prerequisites consist of successfully solving the written homework sheets as well as the computational homework sheets during the associated computer tutorials.

For students of Mechanical Engineering that have chosen a different Major Field and for students from different fields of study the prerequisites consist of successfully solving only the written homework sheets.

Annotation

Knowledge of the contents of the courses "Continuum Mechanics of Solids and Fluids" and "Mathematical Methods of Continuum Mechanics" as well as the corresponding tutorials are expected.

Due to capacity reasons it is possible that not all students of this course can be admitted to the computer tutorials. Students of the bachelor's degree program in mechanical engineering who have chosen the Major Field Continuum Mechanics (SP-Nr 13) will be admitted to the computer tutorials in any case.
If additional places are available in the computer tutorials for this course, these will be allocated according to the BSc average grade.

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

V Tutorial Introduction to the Finite Element Method

2162257, SS 2024, 1 SWS, Language: German, Open in study portal

Practice (Ü)
On-Site

Content

See lecture "Introduction to the Finite Element Method"

Literature

siehe Vorlesung "Einführung in die Finite-Elemente-Methode"

T 8.105 Course: Tutorial IT and Data Science [T-MACH-113409]

Responsible: Prof. Dr.-Ing. Anne Meyer
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106388 - IT and Data Science

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

Events					
ST 2024	2122371	Tutorial IT and Data Science	2 SWS	Practice / 🗣	Meyer

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, × Cancelled

Competence Certificate
Successful completion of exercise sheets. Details will be announced in the first lecture "IT and Data Science".

Prerequisites
none

T 8.106 Course: Tutorial Technical Thermodynamics and Heat Transfer I [T-MACH-112910]

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

Part of: M-MACH-106377 - Technical Thermodynamics

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

Competence Certificate
Successful completion of written preliminary tests.

Annotation
It will be offered for the first time in the winter semester of 2024/2025.

T 8.107 Course: Tutorial Technical Thermodynamics and Heat Transfer II [T-MACH-112911]

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

Part of: M-MACH-106377 - Technical Thermodynamics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework (written)	1	pass/fail	Each summer term	1 terms	1

Competence Certificate
Successful completion of written preliminary tests.

Annotation
It will be offered for the first time in the summer semester of 2025.

T 8.108 Course: Vehicle Ergonomics [T-MACH-108374]

Responsible: Sofie Ehrhardt
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106382 - Mobility Systems

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

Events					
ST 2024	2110050	Vehicle Ergonomics	3 SWS	Lecture / 🗣	Ehrhardt
Exams					
WT 23/24	76-T-MACH-108374	Vehicle Ergonomics			Ehrhardt
ST 2024	76-T-MACH-108374	Vehicle Ergonomics			Ehrhardt

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

Competence Certificate
written exam, 60 minutes

Prerequisites
none

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

V Vehicle Ergonomics
2110050, SS 2024, 3 SWS, Language: German, Open in study portal

Lecture (V)
On-Site

Content
- Basics of physical-body related ergonomics
- Basics of cognitive ergonomics
- Theories of driver behaviour
- interface design
- usability testing

Learning objective:

An ergonomic vehicle is best adapted to the requirements, needs and characteristics of its users and thus enables effective, efficient and satisfying interaction. After attending the lecture, students are able to analyse and evaluate the ergonomic quality of various vehicle concepts and derive design recommendations. They can consider aspects of both physical and cognitive ergonomics. Students are familiar with basic ergonomic methods, theories and concepts as well as with theories of human information processing, especially theories of driver behaviour. They are capable of critically reflecting this knowledge and applying it in a flexible way within the user-centered design process.

Organizational issues
Die Vorlesung hat einen Arbeitsaufwand von 120 h (= 4 LP).

Im SS 2024 sind es noch 2 SWS.
Ab dem SS 2025 sind es 3 SWS.

Literature
Die Literaturliste wird in der Vorlesung ausgegeben. Die Folien zur Vorlesung stehen auf ILIAS zum Download zur Verfügung.

T 8.109 Course: Vehicles in Mobility Systems [T-MACH-112992]

Responsible: Prof. Dr.-Ing. Martin Cichon
Prof. Dr. Frank Gauterin
Prof. Dr.-Ing. Marcus Geimer

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106382 - Mobility Systems

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

Competence Certificate
Written exam, duration 90 minutes

Recommendation
none

Annotation
This brick comprises both lecture (2 SWS) and tutorial (1 SWS) in Vehicles in Mobility Systems.

Lecture notes are made available on ILIAS. For ILIAS access apassword is required. You will receive the password after entering your KIT e-mail address on the web pages of the institute under Studium und Lehre\Lehrveranstaltungen.

T 8.110 Course: Vibration Theory [T-MACH-105290]

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

Part of: M-MACH-106382 - Mobility Systems
M-MACH-106383 - Computational Engineering

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each winter term	3

Events					
WT 23/24	2161212	Vibration Theory	2 SWS	Lecture	Römer
WT 23/24	2161213	Übungen zu Technische Schwingungslehre	2 SWS	Practice	Römer, Keller
Exams					
WT 23/24	7600055	Vibration Theory			Fidlin, Römer
ST 2024	76-T-MACH-105290	Vibration Theory			Fidlin

Competence Certificate
written exam, 180 min.

Prerequisites
none

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

V Vibration Theory

2161212, WS 23/24, 2 SWS, Language: German, Open in study portal

Lecture (V)

Content
Concept of vibration, superposition of vibration with equal and with different frequencies, complex frequency response.

Vibration of systems with one dof: Free undamped and damped vibration, forced vibration for harmonic, periodic and arbitrary excitation. Excitation of undamped vibration in resonance.

Systems with many degrees of freedom: Eigenvalue problem for undamped vibration, orthogonality of eigenvectors, modal decoupling, approximation methods, eigenvalue problem for damped vibration. Forced vibration for harmonic excitation, modal decomposition for arbitrary forced vibration, vibration absorber.

Vibration of systems with distributed parameters: Partial differential equations as equations of motion, wave propagation, d'Alembert's solution, Ansatz for separation of time and space, eigenvalue problem, infinite number of eigenvalues and eigenfunctions.

Introduction to rotor dynamics: Laval rotor in rigid and elastic bearings, inner damping, Laval rotor in anisotropic bearings, synchronous and asynchronous whirl, rotors with asymmetric shaft.

Literature
Klotter: Technische Schwingungslehre, Bd. 1 Teil A, Heidelberg, 1978

Hagedorn, Otterbein: Technische Schwingungslehre, Bd. 1 und Bd. 2, Berlin, 1987

Wittenburg: Schwingungslehre, Springer-Verlag, Berlin, 1995

V Übungen zu Technische Schwingungslehre

2161213, WS 23/24, 2 SWS, Language: German, Open in study portal

Practice (Ü)

Content
Exercises related to the lecture