

Module Handbook

Mechatronics and Information Technology Bachelor 2023

(B.Sc.)

SPO 2023

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



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1 About this handbook

1.1 Notes and rules

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

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

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

1.1.1 Begin and completion of a module

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

1.1.2 Module versions

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

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

1.1.3 General and partial examinations

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

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

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

1.1.4 Types of exams

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

1.1.5 Repeating exams

Principally, a failed written exam, oral exam or alternative exam assessment can be 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 losing the examination claim.

1.1.6 Additional accomplishments

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

1.1.7 Further information

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

2 General Information

2.1 Study program details

KIT-Department	KIT Department of Mechanical Engineering / KIT Department of Electrical Engineering and Information Technology
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 https://www.mach.kit.edu/Bachelor-MIT.php



Amtliche Bekanntmachung

2023

Ausgegeben Karlsruhe, den 24. Juli 2023

Nr. 58

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

vom 24. Juli 2023

Aufgrund von § 10 Absatz 2 Ziffer 4 und § 20 Absatz 2 KIT-Gesetz 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. Juli 2023 die folgende Studien- und Prüfungsordnung für den Bachelorstudiengang Mechatronik und Informationstechnik beschlossen.

Der Präsident hat seine Zustimmung gemäß § 20 Absatz 2 KIT-Gesetz i.V.m. § 32 Absatz 3 Satz 1 Landeshochschulgesetz am 24. Juli 2023 erteilt.

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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

¹Diese Bachelorprüfungsordnung regelt Studienablauf, Prüfungen und den Abschluss des Studiums im Bachelorstudiengang Mechatronik und Informationstechnik am KIT. ²Dieser Studiengang wird gemeinsam von der KIT-Fakultät für Elektrotechnik und Informationstechnik sowie der KIT-Fakultät für Maschinenbau am KIT angeboten.

§ 2 Ziel des Studiums, akademischer Grad

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

(2) ¹Aufgrund der bestandenen Bachelorprüfung wird der akademische Grad „Bachelor of Science (B.Sc.)“ für den Bachelorstudiengang Mechatronik und Informationstechnik verliehen.

§ 3 Regelstudienzeit, Studienaufbau, Leistungspunkte

(1) ¹Der Studiengang nimmt teil am Programm „Studienmodelle individueller Geschwindigkeit“. ²Die 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) ¹Die Regelstudienzeit beträgt sechs Semester. ²Bei einer qualifizierten Teilnahme am MINT-Kolleg bleiben bei der Anrechnung auf die Regelstudienzeit bis zu zwei Semester unberücksichtigt. ³Die konkrete Anzahl der Semester richtet sich nach § 8 Absatz 2 Satz 3 bis 5. ⁴Eine 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 (GesamtworkeLoad 10 Semesterwochenstunden) belegt hat. ⁵Das MINT-Kolleg stellt hierüber eine Bescheinigung aus.

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

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

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

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

§ 4 Modulprüfungen, Studien- und Prüfungsleistungen

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

³Erfolgskontrollen gliedern sich in Studien- oder Prüfungsleistungen.

(2) ¹Prüfungsleistungen sind:

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

(3) ¹Studienleistungen sind schriftliche, mündliche oder praktische Leistungen, die von den Studierenden in der Regel lehrveranstaltungsbegleitend erbracht werden.

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

(5) ¹Bei 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) ¹Um an den Modulprüfungen teilnehmen zu können, müssen sich die Studierenden online im Studierendenportal zu den jeweiligen Erfolgskontrollen anmelden. ²In Ausnahmefällen kann eine Anmeldung schriftlich beim jeweils zuständigen Prüfungssekretariat nach § 17 Absatz 2 Satz 3 erfolgen. ³Für die Erfolgskontrollen können durch die Prüfenden Anmeldefristen festgelegt werden. ⁴Die Anmeldung der Bachelorarbeit erfolgt im Studierendenportal, Näheres ist im Modulhandbuch geregelt.

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

(3) ¹Zu einer Erfolgskontrolle ist zuzulassen, wer

1. in den Bachelorstudiengang Mechatronik und Informationstechnik 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 Mechatronik und Informationstechnik den Prüfungsanspruch nicht verloren hat und
4. die in § 20 a genannte Voraussetzung erfüllt.

(4) ¹Nach Maßgabe von § 30 Absatz 5 Landeshochschulgesetz kann die Zulassung zu einzelnen Pflichtveranstaltungen beschränkt werden. ²Der/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 zusätzli-

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

§ 6 Durchführung von Erfolgskontrollen

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

(2) ¹Die 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 Qualifikationsziele des Moduls festgelegt. ²Die 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. ³Im 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. ⁴Bei 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) ¹Bei unvertretbar hohem Prüfungsaufwand kann eine schriftlich durchzuführende Prüfungsleistung auch mündlich, oder eine mündlich durchzuführende Prüfungsleistung auch schriftlich abgenommen werden. ²Diese Änderung muss mindestens sechs Wochen vor der Prüfungsleistung bekannt gegeben werden.

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

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

(6) ¹Mündliche 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. ²Vor der Festsetzung der Note hört die/der Prüfende die anderen an der Kollegialprüfung mitwirkenden Prüfenden an. ³Mündliche Prüfungen dauern in der Regel mindestens 15 Minuten und maximal 60 Minuten pro Studierenden.

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

⁶Studierende, 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. ⁷Die Zulassung erstreckt sich nicht auf die Beratung und Bekanntgabe der Prüfungsergebnisse.

(7) ¹Für Prüfungsleistungen anderer Art (§ 4 Absatz 2 Nummer 3) sind angemessene Bearbeitungsfristen einzuräumen und Abgabetermine festzulegen. ²Dabei ist durch die Art der Aufgabenstellung und durch entsprechende Dokumentation sicherzustellen, dass die erbrachte Prü-

fungsleistung dem/der Studierenden zurechenbar ist.³ Die wesentlichen Gegenstände und Ergebnisse einer solchen Erfolgskontrolle sind in einem Protokoll festzuhalten.

⁴Bei *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 Hilfsmittel vollständig und genau angegeben und alles kenntlich gemacht zu haben, was aus Arbeiten anderer unverändert oder mit Abänderungen entnommen wurde.“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

¹Für 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

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

(2) ¹Folgende 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.

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

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

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

(7) ¹Die Modulprüfung ist bestanden, wenn alle erforderlichen Erfolgskontrollen bestanden sind.

²Die Modulprüfung und die Bildung der Modulnote sollen im Modulhandbuch geregelt werden.

³Sofern das Modulhandbuch keine Regelung über die Bildung der Modulnote enthält, errechnet sich die Modulnote aus einem nach den Leistungspunkten der einzelnen Teilmodule gewichteten Notendurchschnitt. ⁴Die differenzierten Noten (Absatz 2) sind bei der Berechnung der Modulnoten als Ausgangsdaten zu verwenden.

(8) ¹Die Ergebnisse der Erfolgskontrollen sowie die erworbenen Leistungspunkte werden durch den zuständigen Prüfer bzw. die zuständige Prüferin, unterstützt durch deren Institutsverwaltung, und, sofern erforderlich, durch den Studiengangservice der KIT-Fakultät für Elektrotechnik und Informationstechnik verwaltet.

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

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

(2) ¹Wer 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. ²Eine zweite Wiederholung der Orientierungsprüfungen ist ausgeschlossen.

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

⁵Als Nachweis gilt die vom MINT-Kolleg gemäß § 3 Absatz 2 auszustellende Bescheinigung, die beim Studierendenservice des KIT einzureichen ist. ⁶Im 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) ¹Ist die Bachelorprüfung bis zum Ende des zehnten Fachsemesters einschließlich etwaiger Wiederholungen nicht vollständig abgelegt, so erlischt der Prüfungsanspruch im Bachelorstudiengang Mechatronik und Informationstechnik, es sei denn, dass die Fristüberschreitung nicht selbst zu vertreten ist. ²Die 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. ³Der Antrag ist schriftlich in der Regel bis sechs Wochen vor Ablauf der in Satz 1 genannten Studienhöchstdauer zu stellen. ⁴Absatz 2 Sätze 3 bis 5 gelten entsprechend.

(4) ¹Der 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) ¹Studierende können eine nicht bestandene schriftliche Prüfung (§ 4 Absatz 2 Nummer 1) einmal wiederholen. ²Wird eine schriftliche Wiederholungsprüfung mit „nicht ausreichend“ (5,0) bewertet, so erfolgt in zeitlichem Zusammenhang eine mündliche Fortsetzung der Wiederholungsprüfung (mündliche Nachprüfung). ³Die 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. ⁴Mündliche Nachprüfungen dauern in der Regel mindestens 15 Minuten und maximal 30 Minuten. ⁵§ 6 Absatz 6 Satz 1 und 2 sowie Satz 4 und 5 gelten entsprechend. ⁶Sofern gemäß § 11 eine schriftliche Wiederholungsprüfung als mit „nicht ausreichend“ (5,0) bewertet gilt, ist eine mündliche Nachprüfung ausgeschlossen.

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

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

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

(5) ¹Studienleistungen können mehrfach wiederholt werden.

(6) ¹Die Prüfungsleistung ist endgültig nicht bestanden, wenn die mündliche Nachprüfung im Sinne des Absatzes 1 mit „nicht ausreichend“ (5,0) bewertet wurde. ²Die 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) ¹Das Modul ist endgültig nicht bestanden, wenn eine für sein Bestehen erforderliche Prüfungsleistung endgültig nicht bestanden ist.

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

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

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

(10) ¹Die Bachelorarbeit kann bei einer Bewertung mit „nicht ausreichend“ (5,0) einmal wiederholt werden. ²Eine zweite Wiederholung der Bachelorarbeit ist ausgeschlossen.

§ 10 Abmeldung; Versäumnis, Rücktritt

(1) ¹Studierende können ihre Anmeldung zu *schriftlichen Prüfungen* ohne Angabe von Gründen bis zur Ausgabe der Prüfungsaufgaben widerrufen (Abmeldung). ²Eine Abmeldung kann online im Studierendenportal bis 24:00 Uhr des Vortages der Prüfung oder in begründeten Ausnahmefällen beim jeweils zuständigen Prüfungssekretariat nach § 17 Absatz 2 Satz 3 erfolgen. ³Erfolgt die Abmeldung gegenüber dem/der Prüfenden, hat diese/r Sorge zu tragen, dass die Abmeldung im Campus Management System verbucht wird.

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

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

(4) ¹Eine 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. ²Dasselbe gilt, wenn die Bachelorarbeit nicht innerhalb der vorgesehenen Bearbeitungszeit erbracht wird, es sei denn, der/die Studierende hat die Fristüberschreitung nicht zu vertreten.

(5) ¹Der für den Rücktritt nach Beginn der Erfolgskontrolle oder das Versäumnis geltend gemachte Grund muss dem Prüfungsausschuss unverzüglich schriftlich angezeigt und glaubhaft gemacht werden. ²Bei 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) ¹Versuchen 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) ¹Studierende, die den ordnungsgemäßen Ablauf einer Erfolgskontrolle stören, können von der/dem Prüfenden oder der Aufsicht führenden Person von der Fortsetzung der Erfolgskontrolle ausgeschlossen werden. ²In diesem Fall gilt die betreffende Erfolgskontrolle als mit „nicht ausreichend“ (5,0) bewertet. ³In schwerwiegenden Fällen kann der Prüfungsausschuss diese Studierenden von der Erbringung weiterer Erfolgskontrollen ausschließen.

(3) ¹Näheres regelt die Allgemeine Satzung des KIT zur Redlichkeit bei Prüfungen und Praktika in der jeweils gültigen Fassung.

§ 12 Mutterschutz, Elternzeit, Wahrnehmung von Familienpflichten

¹Für 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

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

(1 a) ¹Dem Modul Bachelorarbeit sind 15 LP zugeordnet. ²Es besteht aus der Bachelorarbeit mit 12 LP und einer Präsentation mit 3 LP. ³Die Präsentation hat innerhalb der maximalen Bearbeitungszeit gemäß Absatz 4 Satz 2, jedoch spätestens sechs Wochen nach Abgabe der Bachelorarbeit zu erfolgen.

(2) ¹Die Bachelorarbeit kann von Hochschullehrerinnen und Hochschullehrern am KIT vergeben werden. ²Darüber hinaus kann der Prüfungsausschuss weitere Prüfende gemäß § 18 Absatz 2 und 3 zur Vergabe des Themas berechtigen. ³Den Studierenden ist Gelegenheit zu geben, für das Thema Vorschläge zu machen. ⁴Soll die Bachelorarbeit außerhalb der nach § 1 Satz 2 beteiligten KIT-Fakultäten angefertigt werden, so bedarf dies der Genehmigung durch den Prüfungsausschuss. ⁵Die 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. ⁶In 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. ⁷Die Ausgabe des Themas erfolgt in diesem Fall über die/den Vorsitzende/n des Prüfungsausschusses.

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

(5) ¹Bei 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. ²Wenn diese Erklärung nicht enthalten ist, wird die Arbeit nicht angenommen. ³Die Erklärung kann wie folgt lauten: „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.“ ⁴Bei Abgabe einer unwahren Versicherung wird die Bachelorarbeit mit „nicht ausreichend“ (5,0) bewertet.

(6) ¹Der 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. ²Der Zeitpunkt der Abgabe der Bachelorarbeit ist durch den/die Prüfende/n beim Prüfungsausschuss aktenkundig zu machen. ³Das Thema kann nur einmal und nur innerhalb des ersten Monats der Bearbeitungszeit zurückgegeben werden. ⁴Macht der oder die Studierende einen triftigen Grund geltend, kann der Prüfungsausschuss die in Absatz 4 festgelegte Bearbeitungszeit auf Antrag der oder des Studierenden um höchstens einen Monat verlängern. ⁵Wird 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) ¹Die Bachelorarbeit wird von mindestens einer Hochschullehrerin oder einem Hochschullehrer am KIT bzw. einem habilitierten Mitglied der gemäß § 1 Satz 2 beteiligten KIT-Fakultäten und einem/einer weiteren Prüfenden bewertet. ²In der Regel ist eine/r der Prüfenden die Person, die die Arbeit gemäß Absatz 2 vergeben hat. ³Bei 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. ⁴Die Bewertung hat innerhalb von sechs Wochen nach Abgabe der Bachelorarbeit zu erfolgen.

§ 14 a Berufspraktikum

(1) ¹Während des Bachelorstudiums ist ein mindestens 13-wöchiges Berufspraktikum abzuleisten, welches geeignet ist, den Studierenden eine Anschauung von berufspraktischer Tätigkeit auf dem Gebiet der Mechatronik und Informationstechnik zu vermitteln. ²Dem Berufspraktikum sind 15 Leistungspunkte zugeordnet.

(2) ¹Die Studierenden setzen sich in eigener Verantwortung mit geeigneten privaten oder öffentlichen Einrichtungen in Verbindung, an denen das Praktikum abgeleistet werden kann. ²Das Nähere regelt das Modulhandbuch.

§ 15 Zusatzleistungen

(1) ¹Es 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. ³Diese Zusatzleistungen gehen nicht in die Festsetzung der Gesamt- und Modulnoten ein. ⁴Die bei der Festlegung der Modulnote nicht berücksichtigten LP werden als Zusatzleistungen im Transcript of Records aufgeführt und als Zusatzleistungen gekennzeichnet. ⁵Auf Antrag der/des Studierenden werden die Zusatzleistungen in das Bachelorzeugnis aufgenommen und als Zusatzleistungen gekennzeichnet. ⁶Zusatzleistungen werden mit den nach § 7 vorgesehenen Noten gelistet.

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

§ 15 a Mastervorzug

¹Studierende, 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. ³Die Mastervorzugsleistungen gehen nicht in die Festsetzung der Gesamt-, Fach- und Modulnoten ein. ⁴Sie werden im Transcript of Records aufgeführt und als solche gekennzeichnet sowie mit den nach § 7 vorgesehenen Noten gelistet. ⁵§ 15 Absatz 2 gilt entsprechend.

§ 16 Überfachliche Qualifikationen

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

§ 17 Prüfungsausschuss

(1) ¹Für den Bachelorstudiengang Mechatronik und Informationstechnik wird ein Prüfungsausschuss gebildet. ²Er besteht aus vier stimmberechtigten Mitgliedern: zwei Hochschullehrerinnen bzw. Hochschullehrer am KIT / Privatdozentinnen bzw. -dozenten, zwei akademischen Mitarbeiterinnen und akademischen Mitarbeitern am KIT aus den nach § 1 Satz 2 beteiligten KIT-Fakultäten und zwei Studierenden mit beratender Stimme. ³Im Falle der Einrichtung eines ge-

meinsamen Prüfungsausschusses für den Bachelor- und den Masterstudiengang Mechatronik und Informationstechnik erhöht sich die Anzahl der Studierenden auf vier Mitglieder mit beratender Stimme, wobei jeweils zwei aus dem Bachelor- und aus dem Masterstudiengang stammen.

⁴Die Amtszeit der nichtstudentischen Mitglieder beträgt zwei Jahre, die der studentischen Mitglieder ein Jahr.

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

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

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

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

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

§ 18 Prüfende und Beisitzende

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

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

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

§ 19 Anerkennung von Studien- und Prüfungsleistungen, Studienzeiten

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

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

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

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

(6) ¹Zuständig für Anerkennung und Anrechnung ist der Prüfungsausschuss. ²Im Rahmen der Feststellung, ob ein wesentlicher Unterschied im Sinne des Absatz 1 vorliegt, sind die zuständigen Fachvertreter/innen zu hören.

II. Bachelorprüfung

§ 20 Umfang und Art der Bachelorprüfung

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

(2) ¹Es sind Modulprüfungen in folgenden Pflichtfächern abzulegen:

1. Ingenieurwissenschaftliche Grundlagen: Modul(e) im Umfang von 111 LP,
2. Vertiefung in der Mechatronik: Modul(e) im Umfang von 35 LP,
3. Überfachliche Qualifikationen im Umfang von 4 LP gemäß § 16.

²Die Vermittlung weiterer überfachlicher Qualifikationen im Umfang von 2 LP gemäß § 16 findet im Rahmen der fachwissenschaftlichen Module Lineare Elektrische Netze, Elektronische Schaltungen sowie Signale und Systeme im Pflichtfach Ingenieurwissenschaftliche Grundlagen statt.

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

§ 21 Bestehen der Bachelorprüfung, Bildung der Gesamtnote

(1) ¹Die Bachelorprüfung ist bestanden, wenn alle in § 20 genannten Modulprüfungen bestanden sind.

(2) ¹Die 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.

²Dabei wird die Note des Moduls Bachelorarbeit mit dem doppelten Gewicht der Noten der übrigen Fächer berücksichtigt.

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

(2) ¹Das Zeugnis enthält die Fach- und Modulnoten sowie die den Modulen und Fächern zugeordneten Leistungspunkte und die Gesamtnote. ²Sofern 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. ³Das Zeugnis ist von den KIT-Dekaninnen/den KIT-Dekanen der gemäß § 1 Satz 2 beteiligten KIT-Fakultäten und von der/dem Vorsitzenden des Prüfungsausschusses zu unterzeichnen.

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

⁶Alle Zusatzleistungen werden im Transcript of Records aufgeführt.

- (5)** ¹Die Bachelorurkunde, das Bachelorzeugnis und das Diploma Supplement einschließlich des Transcript of Records werden vom Studierendenservice des KIT ausgestellt.

III. Schlussbestimmungen

§ 23 Bescheinigung von Prüfungsleistungen

¹Haben 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. ²Dasselbe gilt, wenn der Prüfungsanspruch erloschen ist.

§ 24 Aberkennung des Bachelorgrades

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

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

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

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

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

§ 25 Einsicht in die Prüfungsakten

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

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

(4) ¹Prüfungsunterlagen sind mindestens fünf Jahre aufzubewahren.

§ 26 Inkrafttreten, Übergangsvorschriften

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

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

(2) ¹Die Studien- und Prüfungsordnung des KIT für den Bachelorstudiengang Mechatronik und Informationstechnik vom 10. Mai 2016 (Amtliche Bekanntmachung des KIT Nummer 29 vom 10. Mai 2016) zuletzt geändert durch Artikel 24 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 Mechatronik und Informationstechnik am KIT zuletzt im Sommersemester 2023 aufgenommen haben, sowie für
2. Studierende, die ihr Studium im Bachelorstudiengang Mechatronik und Informationstechnik 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 Ziff. 1 erreicht hat.

²Im Übrigen tritt sie außer Kraft.

(3) ¹Studierende, die auf Grundlage der Studien- und Prüfungsordnung für den Bachelorstudiengang Mechatronik und Informationstechnik vom 10. Mai 2016 (Amtliche Bekanntmachung des KIT Nummer 29 vom 10. Mai 2016) zuletzt geändert durch Artikel 24 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 am 30. September 2029 ablegen.

Karlsruhe, den 24. Juli 2023

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

Qualification Objectives

Having passed KIT's research-oriented and practice-based six-semester Bachelor's Program of Mechatronics and Information Technology, graduates are prepared for lifelong learning and employment in typical professional fields of mechatronics in industry, the service sector, and public administration. Graduates have acquired the scientific knowledge and methodological skills needed to pursue the Master's Program of Mechatronics and Information Technology or master's programs in related disciplines.

In the course of the basic studies, graduates acquire sound basic knowledge in mathematics, mechanics, and electrical engineering, complemented by basic knowledge of mechanical design, automation and information technology, production technology, and mechatronic systems and products. Moreover, students learn to link these disciplines for developing interdisciplinary problem solutions. This in-depth knowledge of scientific theories, principles, and methods enables graduates to successfully deal with clearly specified problems having a unique solution approach in mechatronics.

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

Graduates of the Bachelor's Program of Mechatronics and Information Technology at KIT can select basic methods to create and compare models under familiar conditions. They are able to tackle given problems and to work independently on the 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.

Ansprechpersonen im Bachelorstudiengang Mechatronik und Informationstechnik

Studiengangservice Bachelor und Prüfungsausschuss

Beim MIT-Beratungsteam der Fakultät ETIT finden Sie Ihre Ansprechpersonen bei Fragen zum Studiengang, Studienverlauf und Verwaltungsabläufen. Sie sind außerdem Ihre erste Anlaufstelle bei Anfragen oder Anträgen an den Prüfungsausschuss.

Studiengangservice ETIT (Geb. 30.36, Raum 115 &117)
Tel.: 0721/608-42636 oder -42746, E-Mail: Bachelor-Info@etit.kit.edu

Praktikantenamt

Fragen zum Berufspraktikum stellen Studierende an das Praktikantenamt der Fakultät ETIT,
E-Mail: praktikantenamt@etit.kit.edu

Fachstudienberatung

Studiendekane:
Prof. Dr.-Ing. Martin Doppelbauer (martin.doppelbauer@kitedu) und .
Prof. Dr.-Ing. Marcus Geimer (marcus.geimer@kit.edu)

Studierendenservice

Bei organisatorischen Fragen zum Studium (Bewerbung, Einschreibung, Rückmeldung, Abschlussdokumente, Bescheinigungen, ...):
<https://www.sle.kit.edu/wirueberuns/studierendenservice.php>
Kontaktpersonen bezüglich des Studienganges:
https://www.sle.kit.edu/wirueberuns/studierendenservice_team4.php

Auslandsaufenthalt

Sie können einen Auslandsaufenthalt über beide Fakultäten planen:

ETIT: <https://www.etit.kit.edu/internationales.php>

MACH: International Studieren im Maschinenbau (ISIM), E-Mail: isim@mach.kit.edu
<https://www.mach.kit.edu/4201.php>

Anerkennung von Studien- und Prüfungsleistungen im Bachelorstudiengang Mechatronik und Informationstechnik

Grundsätzliche Regelungen

Die grundsätzlichen Regelungen finden sich in den Studien- und Prüfungsordnungen:
Bachelor MIT SPO 2023 vom 24.07.2023, §19

Danach können die im Studienplan jeweils geforderten Leistungen auch durch Anerkennung externer Leistungen erbracht werden.

Externe Leistungen können dabei wie folgt erworben sein:

1. innerhalb des Hochschulsystems (weltweit)
2. außerhalb des Hochschulsystems (an Institutionen mit genormtem Qualitätssicherungssystemen; die Anerkennung kann versagt werden, wenn mehr als 50 Prozent des Hochschulstudiums ersetzt werden sollen)

Die Anerkennung erfolgt auf Antrag der Studierenden, unter der Voraussetzung, dass hinsichtlich der erworbenen Kompetenzen kein wesentlicher Unterschied zu den Leistungen oder Abschlüssen besteht, die ersetzt werden sollen. Der Antrag muss innerhalb des ersten Semesters nach Immatrikulation am KIT gestellt werden. Zuständig für Anerkennung und Anrechnung ist der Prüfungsausschuss, der unter Einbeziehung der fachlichen Prüfung durch den zuständigen Fachvertreter über die Anerkennung entscheidet. Anerkannte Leistungen, die nicht am KIT erbracht wurden, werden im Notenauszug als „anerkannt“ ausgewiesen.

Benotung

Wenn es sich um ein vergleichbares Notensystem handelt, wird die Note der anzuerkennenden Leistung übernommen. Bei nicht vergleichbaren Notensystemen wird die Note umgerechnet. Prüfungsleistungen, die anstelle einer benoteten Prüfungsleistung anerkannt werden sollen, müssen ebenfalls benotet sein.

Vorgehensweise

- I. Gehen Sie zunächst zu einer Fachprüferin oder einem Fachprüfer* und legen Sie dort das Antragsformular zusammen mit den erforderlichen Unterlagen vor**.
Wichtig: Anerkennungen müssen innerhalb des ersten Semesters nach Immatrikulation beim Prüfungsausschuss beantragt werden.
- II. Besteht Gleichwertigkeit im Hinblick auf die erworbenen Kompetenzen (Qualifikationsziele), wird dies mit Stempel und Unterschrift durch die Fachprüferin oder den Fachprüfer bestätigt.
- III. Geben Sie dann den fertig ausgefüllten und unterschriebenen Antrag zusammen mit dem entsprechenden Notenauszug im Büro des Prüfungsausschusses ab.

Hinweis zu Auslandsprüfungsleistungen

Bei Anerkennung von Prüfungsleistungen aus einem Auslandssemester ist es empfehlenswert, vor dem Auslandsaufenthalt die geplanten Auslandsprüfungsleistungen im Hinblick auf die spätere Anerkennung mit einem Fachstudienberater zu besprechen.

*Wenn Sie eine Leistung anstelle eines KIT-Moduls anerkennen lassen möchten, wenden Sie sich für die Fachprüfung an die/den Modulverantwortliche/n des KIT-Moduls. Für Anerkennungen im Wahlbereich/Interdisziplinären Fach/Profiliengsfach wenden Sie sich an eine/n der Fachstudienberater*innen der Fakultät ETIT.

**Für die Anerkennung erforderlich sind Unterlagen, auf denen die der Anerkennung zugrundeliegenden Prüfungsleistungen dokumentiert sind. (Zeugnisse, Transcript of Records, Auszüge aus dem Modulhandbuch, Skripte o.ä.). Bei Unterlagen, die nicht in deutscher oder englischer Sprache vorliegen, kann eine amtlich beglaubigte Übersetzung verlangt werden.

Falls Sie weitere Fragen haben, wenden Sie sich gerne an den Studiengangservice Bachelor:
bachelor-info@etit.kit.edu, Tel.: 0721/608-42636 oder -42746, Geb. 30.36, 1. OG, Raum 117

Studienplan für den Bachelorstudiengang Mechatronik und Informationstechnik

Dieser Studienplan tritt zum 01.10.2023 in Kraft und ist gültig für den Bachelorstudiengang Mechatronik und Informationstechnik gemäß der SPO 2023 (2016_AB_029 vom 10.05.2016).

Alle Informationen rund um die rechtlichen und amtlichen Rahmenbedingungen des Studiums finden Sie in der jeweiligen Studien- und Prüfungsordnung Ihres Studiengangs. Diese ist unter den Amtlichen Bekanntmachungen des KIT (<https://www.sle.kit.edu/amtlicheBekanntmachungen.php>) abrufbar.

Zusammensetzung der Leistungspunkte (LP)

- Pflichtfach „Ingenieurwissenschaftliche Grundlagen“: 111 LP
- Vertiefungsfach „Vertiefung in der Mechatronik“: 35 LP
- Fach „Überfachliche Qualifikationen“: 4 LP
- Berufspraktikum: 15 LP
- Bachelorarbeit: 15 LP

Module im Pflichtfach „Ingenieurwissenschaftliche Grundlagen“

M-ETIT-106337 – Elektrische Energietechnik (6 LP)

M-ETIT-106419 – Elektromagnetische Felder (4 LP)

M-ETIT-104465 – Elektronische Schaltungen (7 LP)

M-ETIT-106407 – Grundlagen der Digitaltechnik (4 LP)

M-MACH-106535 – Grundlagen der Fertigungstechnik (3 LP)

M-MATH-102859 – Höhere Mathematik (21 LP)

M-ETIT-106336 – Informations- und Automatisierungstechnik (7 LP)

M-ETIT-106417 – Lineare Elektrische Netze (8 LP)

M-MACH-106527 – Maschinenkonstruktionslehre A (7 LP)

M-MACH-106493 – Mechatronische Systeme und Produkte (7 LP)

M-ETIT-106339 – Mess- und Regelungstechnik (6 LP)

M-ETIT-106372 – Signale und Systeme (8 LP)

M-ETIT-106415 – Systemmodellierung (2 LP)

M-MACH-106374 – Technische Mechanik (21 LP)

Studienplan B.Sc. Mechatronik und Informationstechnik SPO 2023

Module im Vertiefungsfach „Vertiefung in der Mechatronik“

Die Vertiefung in der Mechatronik erlaubt die Abbildung einer Präferenz Richtung „Elektrotechnik und Informationstechnik“ oder „Maschinenbau“ und in geringerem Umfang Richtung „Informatik“ oder „Wirtschaftswissenschaften“. Es wird empfohlen, die gewünschten Module zuerst in Wahlblock 1 und 2 zu wählen und dann im Wahlblock 3 die offenen Leistungspunkte aufzufüllen.

Das Vertiefungsfach setzt sich aus 3 Wahlblöcken zusammen. Die Wahlblöcke und die jeweiligen Wahlmöglichkeiten sind im Modulhandbuch beschrieben.

Wahlblock 1: „Elektrotechnik und Informationstechnik“

Im Wahlblock 1 sind zwei Module zu wählen, es können aber auch drei Module gewählt werden.

Wahlblock 2: „Maschinenbau“

Im Wahlblock 2 ist ein Modul zu wählen, es können aber auch zwei Module gewählt werden.

Wahlblock 3:

„Elektrotechnik und Informationstechnik, Maschinenbau, Informatik, Wirtschaftswissenschaften“

Nachdem die Wahlblöcke 1 und 2 gewählt wurden, werden im Wahlblock 3 so viele Module gewählt, bis in der Vertiefung der Mechatronik insgesamt 35 LP erreicht sind.

Modul im Fach „Überfachliche Qualifikationen“

Das Fach „überfachliche Qualifikationen“ besteht aus dem Modul M-MACH-106583 Schlüsselqualifikationen (4 LP) mit den Wahlblöcken „Technikethik“ und „Schlüsselqualifikation“.

In jedem Wahlblock wird jeweils eine Lehrveranstaltung absolviert.

Die Vermittlung weiterer überfachlicher Qualifikationen im Umfang von 2 LP gemäß § 16 SPO findet im Rahmen der fachwissenschaftlichen Module „Lineare Elektrische Netze“, „Elektronische Schaltungen“ und „Signale und Systeme“ im Pflichtfach „Ingenieurwissenschaftliche Grundlagen“ statt.

Weitere überfachliche Qualifikationen können als Zusatzleistung erworben werden.

Modul Berufspraktikum

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

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

Modul Bachelorarbeit

Modul M-MACH-106579 - Bachelorarbeit (15 LP)

Das Modul Bachelorarbeit hat einen Umfang von 15 LP. Es besteht aus der Bachelorarbeit mit 12 LP und einer Präsentation mit 3 LP. Die Bachelorarbeit kann von jedem Hochschullehrer/in der KIT-Fakultäten Elektrotechnik und Informationstechnik und Maschinenbau vergeben und betreut werden.

Die maximale Bearbeitungsdauer beträgt sechs Monate. Voraussetzung zur Zulassung zur Bachelorarbeit ist, dass der/die Studierende Modulprüfungen im Umfang von 120 LP erfolgreich abgelegt hat.

Die Note des Moduls Bachelorarbeit wird bei der Bildung der Gesamtnote mit dem doppelten Gewicht berücksichtigt (SPO § 21(2)).

Modul Orientierungsprüfung

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

Studienplan B.Sc. Mechatronik und Informationstechnik SPO 2023

Modul Zusatzleistungen

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

Modul Mastervorzug

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

Prüfungsart und -dauer

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

Exemplarischer Studienablaufplan

Sem.	Fach	Modul	Teilleistungen	LP	Prüfung / Studienleistung
1	Ingenieurwissenschaftliche Grundlagen	M-MATH-102859	T-MATH-100525 - Übungen zu Höhere Mathematik I T-MATH-100275 - Höhere Mathematik I	7	Studienleistung Prüfung
		M-MACH-106374	T-MACH-112907 - Übungen zu Technische Mechanik I T-MACH-112904 - Technische Mechanik I	1 6	Studienleistung Prüfung
		M-ETIT-106417	T-ETIT-109317 - Lineare Elektrische Netze - Workshop A T-ETIT-109811 - Lineare Elektrische Netze - Workshop B T-ETIT-113001 - Lineare Elektrische Netze	1 1 6	Studienleistung Studienleistung Prüfung
		M-ETIT-106407	T-ETIT-112872 – Grundlagen der Digitaltechnik	4	Prüfung
		M-MACH-106527	T-MACH-112981 - Workshop zu Maschinenkonstruktionslehre A T-MACH-112984 - Maschinenkonstruktionslehre A	1 6	Studienleistung Prüfung
2	Überfachliche Qualifikationen	M-MACH-106583	Teilleistung aus Wahlpflichtblock: Technikethik	2	Studienleistung
		M-MATH-102859	T-MATH-100526 - Übungen zu Höhere Mathematik II T-MATH-100276 - Höhere Mathematik II	7	Studienleistung Prüfung
		M-MACH-106374	T-MACH-112908 - Übungen zu Technische Mechanik II T-MACH-112905 – Technische Mechanik II	1 6	Studienleistung Prüfung
		M-ETIT-104465	T-ETIT-109138 - Elektronische Schaltungen - Workshop T-ETIT-109318 - Elektronische Schaltungen	1 6	Studienleistung Prüfung
		M-ETIT-106336	T-ETIT-112879 – Informations- und Automatisierungstechnik – Praktikum T-ETIT-112878 – Informations- und Automatisierungstechnik	2 5	Studienleistung Prüfung
3	Ingenieurwissenschaftliche Grundlagen	M-MATH-102859	T-MATH-100527 - Übungen zu Höhere Mathematik III T-MATH-100277 - Höhere Mathematik III	7	Studienleistung Prüfung
		M-MACH-106374	T-MACH-112909 - Übungen zu Technische Mechanik III T-MACH-112906 – Technische Mechanik III	1 6	Studienleistung Prüfung
		M-MACH-106535	T-MACH-112928 – Grundlagen der Fertigungstechnik	3	Prüfung
		M-ETIT-106415	T-ETIT-112989 – Systemmodellierung	2	Prüfung
		M-ETIT-106372	T-ETIT-112860 – Signale und Systeme	7	Prüfung
		M-ETIT-106419	T-ETIT-113004 – Elektromagnetische Felder	4	Prüfung

Gültig ab WS 23/24, Stand 02.11.2023 für den Bachelorstudiengang
Mechatronik und Informationstechnik gemäß der SPO 2023 (2023_AB_058 vom 24. Juli 2023)

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Studienplan B.Sc. Mechatronik und Informationstechnik SPO 2023

Sem.	Fach	Modul	Teilleistungen	LP	Prüfung / Studienleistung
4	Ingenieurwissenschaftliche Grundlagen	M-ETIT-106372	T-ETIT-112861 – Signale und Systeme - Workshop	1	Studienleistung
		M-MACH-106493	T-MACH-112988 – Mechatronische Systeme und Produkte	3	Prüfung
		M-ETIT-106339	T-ETIT-112852 – Mess- und Regelungstechnik	6	Prüfung
		M-ETIT-106337	T-ETIT-112850 – Elektrische Energietechnik	6	Prüfung
5	Vertiefung in der Mechatronik		Beispiel siehe S. 5	13	
		M-MACH-106493	T-MACH-108680 Workshop Mechatronische Systeme und Produkte	4	Prüfungsleistungen anderer Art
		M-MACH-106583	Teilleistung aus Wahlpflichtblock: Schlüsselqualifikation	2	Studienleistung
			Beispiel siehe S. 5	22	
6		M-MACH-106582	T-MACH-113256 – Berufspraktikum	15	Studienleistung
		M-MACH-106579	T-MACH-113254 – Präsentation T-MACH-113253 – Bachelorarbeit	3 12	Studienleistung Abschlussarbeit

Exemplarische Wahloption

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

Sem.	Wahl-block	Modul	Teilleistungen	LP	Prüfung / Studienleistung
4	1	M-ETIT-106474	Systems Engineering und KI-Verfahren	6	Prüfung
	2	M-MACH-106378	Strömungslehre	7	Prüfung
5	1	M-ETIT-100514	Hybride und elektrische Fahrzeuge	4	Prüfung
	2	M-MACH-102386	Technische Thermodynamik und Wärmeübertragung I	7	Prüfung
	3	M-ETIT-102104	Wahrscheinlichkeitstheorie	5	Prüfung
	3	M-INFO-100893	Robotik I - Einführung in die Robotik	6	Prüfung

Gültig ab WS 23/24, Stand 02.11.2023 für den Bachelorstudiengang
Mechatronik und Informationstechnik gemäß der SPO 2023 (2023_AB_058 vom 24. Juli 2023)

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1. Semester	2. Semester	3. Semester	4. Semester	5. Semester	6. Semester
Ingenieurwissenschaftliche Grundlagen/ 111 LP					
Höhere Mathematik Ü zu HM 1 HM 1 0 LP 7 LP SL SP	Höhere Mathematik Ü zu HM 2 HM 2 0 LP 7 LP SL SP	Höhere Mathematik Ü zu HM 3 HM 3 0 LP 7 LP SL SP	Mechatronische Systeme und Produkte MSuP 3 LP SP	W zu MSuP 4 LP PaA	Berufspraktikum / 15 LP Berufspraktikum 15 LP SL
Technische Mechanik Ü zu TM 1 TM 1 1 LP 6 LP SL SP	Technische Mechanik Ü zu TM 2 TM 2 1 LP 6 LP SL SP	Technische Mechanik Ü zu TM 3 TM 3 1 LP 6 LP SL SP	MRT Mess- und Regelungstechnik 6 LP SP	Bachelorarbeit / 15 LP Bachelorarbeit 12 LP 3 LP AA SL	
MKL A W zu MKL A MKL A 1 LP 6 LP SL SP	Info & Automat Pr I&A I&A 2 LP 5 LP SL SP	GL d Fertigungstechnik Grundlagen der FT 3 LP SP	Elektr. Energietechnik Elektrische Energietechnik 6 LP SP		Abkürzungen AA: Abschlussarbeit BA: Bachelorarbeit EF: Elektromagnetische Felder ELS: Elektronische Schaltungen FT: Fertigungstechnik GL d: Grundlagen der HM: Höhere Mathematik I&A / Info & Automat: Informations- und Automatisierungstechnik LEN / Lin. Elektr. Netze: Lineare elektrische Netze LP: Leistungspunkt(e) M: Mechatronik MKL: Maschinenkonstruktionslehre MRT: Mess- und Regelungstechnik MSuP: Mechatronische Systeme und Produkte PaA: Prüfung anderer Art Pr: Praktikum SL: Studienleistung SP: Schriftliche Prüfung SQ: Schlüsselqualifikation TL: Teilleistung TM: Technische Mechanik Ü: Übungen W: Workshop
GL d Digitaltechnik Grundlagen der DT 4 LP SP	Elektron. Schaltungen W ELS ELS 1 LP 6 LP SL SP	Systemmodellierung Systemmodellierung 2 LP SP	Signale und Systeme Signale und Systeme 7 LP SLP	W zu Signale und Systeme 1 LP SL	
Lin. Elektr. Netze WA WB LEN 1 LP 1 LP 6 LP SL SL SP			Elektromagnet. Felder EF 4 LP SP		
Erklärung zu den Modulen:					
Modulname Teilleistung(en) im Modul Leistungspunkte der TL(en) Prüfungsform(en)			Überfachliche Qualifikation / 4 LP		
Blau: Pflichtmodule, keine individuelle Wahl möglich	SQ Technikethik 2 LP SL		SQ Schlüsselqualifikation 2 LP SL		
Grün: Module, in denen individuelle Wahlmöglichkeiten bestehen					
33 LP	30 LP	30 LP	29 LP	28 LP	30 LP
180 LP					
Vertiefung / 35 LP					
Vertiefung in der Mechatronik 13 LP TL 1: y LP 2 - 3 S/M Pr. bis TL x: z LP 3-4 Pr. je nach Wahl					

9 Field of study structure

Mandatory	
Orientation Exam <i>This field will not influence the calculated grade of its parent.</i>	
Bachelor's Thesis	15 CR
Internship	15 CR
Engineering Fundamentals	111 CR
Specialization in Mechatronics	35 CR
Interdisciplinary Qualifications	4 CR
Voluntary	
Additional Examinations <i>This field will not influence the calculated grade of its parent.</i>	
Master's Transfer Account <i>This field will not influence the calculated grade of its parent.</i>	

9.1 Orientation Exam

Mandatory	
M-MACH-106549	Orientation Exam

9.2 Bachelor's Thesis

Credits
15

Mandatory	
M-MACH-106579	Bachelor's Thesis

9.3 Internship

Credits
15

Mandatory	
M-MACH-106582	Internship

9.4 Engineering Fundamentals

Credits
111

Mandatory		
M-ETIT-106337	Electric Energy Systems	6 CR
M-ETIT-106419	Electromagnetic Fields	4 CR
M-ETIT-104465	Electronic Devices and Circuits	7 CR
M-ETIT-106407	Fundamentals of Digital Technology	4 CR
M-MACH-106535	Basics of Manufacturing Technology	3 CR
M-MATH-102859	Advanced Mathematics	21 CR
M-ETIT-106336	Information and Automation Technology	7 CR
M-ETIT-106417	Linear Electric Circuits	8 CR
M-MACH-106527	Mechanical Design A	7 CR
M-MACH-106493	Mechatronics Systems and Products	7 CR
M-ETIT-106339	Measurement and Control Technology	6 CR
M-ETIT-106372	Signals and Systems	8 CR
M-ETIT-106415	Systems Modeling	2 CR
M-MACH-106374	Engineering Mechanics	21 CR

9.5 Specialization in Mechatronics

Credits
35

Election notes

In the specialization in Mechatronics, students can choose modules in the direction of "Electrical Engineering and Information Technology" or "Mechanical Engineering" and, to a lesser extent, "Computer Science" or "Economics", depending on their own inclinations.

In order to successfully complete the specialization **in the elective block 1 "Electrical Engineering and Information Technology" and in the elective block 2 "Mechanical Engineering"**, **at least 9 CP must be selected**. This means that several modules are selected in elective block 1 until 9 CP has been achieved and one module is selected in elective block 2 "Mechanical Engineering".

In elective block 3 "Electrical Engineering and Information Technology, Mechanical Engineering, Computer Science, Economics", as many modules are selected until a total of 35 CP is achieved in the specialization in Mechatronics.

It is strongly recommended to select the desired modules in elective blocks 1 and 2 first and to fill up the remaining credit points in elective block 3.

Compulsory Elective Modules: Part 1: Electrical Engineering and Information Technology (Election: at least 9 credits)		
M-ETIT-106471	Electromagnetic Waves	3 CR
M-ETIT-106338	Fundamentals of Data Transmission	6 CR
M-ETIT-100514	Hybrid and Electric Vehicles	4 CR
M-ETIT-104823	Laboratory for Applied Machine Learning Algorithms	6 CR
M-ETIT-105356	Seminar: Fundamentals of Embedded Systems	4 CR
M-ETIT-106474	Systems Engineering and AI-Methods	6 CR
M-ETIT-102104	Theory of Probability	5 CR
Compulsory Elective Modules: Part 2: Mechanical Engineering (Election: at least 9 credits)		
M-MACH-106528	Mechanical Design B-C	12 CR
M-MACH-102567	Material Science and Engineering	9 CR
M-MACH-106668	Fluid Mechanics and Technical Thermodynamics and Heat Transfer I <small>First usage possible from 10/1/2023.</small>	14 CR
M-MACH-106671	Production Technology	12 CR
Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management (Election: between 0 and 17 credits)		
M-INFO-100030	Algorithms I	6 CR
M-INFO-100764	Accessibility - Assistive Technologies for Visually Impaired Persons	3 CR
M-ETIT-103271	Battery Modeling in MATLAB	3 CR
M-ETIT-102651	Image Processing	3 CR
M-MACH-102684	CAE-Workshop	4 CR
M-WIWI-101418	Introduction to Operations Research	9 CR
M-INFO-100736	Introduction to Video Analysis	3 CR
M-ETIT-105276	Introduction to High Voltage Engineering	3 CR
M-ETIT-102156	Electric Energy Systems	5 CR
M-ETIT-106471	Electromagnetic Waves	3 CR
M-ETIT-102113	Basic Electronic Circuits Laboratory	6 CR
M-ETIT-100407	Power Generation	3 CR
M-ETIT-106338	Fundamentals of Data Transmission	6 CR
M-ETIT-100514	Hybrid and Electric Vehicles	4 CR
M-ETIT-104823	Laboratory for Applied Machine Learning Algorithms	6 CR
M-ETIT-100518	Laboratory Circuit Design	6 CR
M-MACH-106528	Mechanical Design B-C	12 CR
M-ETIT-106449	Medical Imaging Technology I	3 CR
M-INFO-100729	Human Computer Interaction	6 CR
M-ETIT-106373	Methods for Automation, Control Engineering and Robotics	6 CR
M-INFO-101249	Mobile Computing and Internet of Things	5 CR
M-MACH-100296	Modelling and Simulation	5 CR
M-ETIT-105274	Communications Engineering II	4 CR
M-ETIT-105005	Optics and Solid State Electronics	6 CR
M-ETIT-100509	Optoelectronic Components	4 CR
M-ETIT-100411	Photovoltaic System Design	3 CR
M-ETIT-100390	Physiology and Anatomy for Engineers I	3 CR
M-ETIT-103263	Laboratory Hardware and Software in Power Electronic Systems	6 CR
M-MACH-106195	Product Lifecycle Management	4 CR
M-INFO-101174	Programming	5 CR
M-ETIT-100562	Radiation Protection	3 CR
M-ETIT-105124	Radio-Frequency Electronics	5 CR
M-INFO-103179	Computer Organization	6 CR
M-INFO-100893	Robotics I - Introduction to Robotics	6 CR
M-ETIT-103037	Seminar Battery	3 CR
M-ETIT-105320	Seminar Fuel Cell I	3 CR

M-ETIT-105356	Seminar: Fundamentals of Embedded Systems	4 CR
M-ETIT-100397	Seminar Power Electronics in Regenerative Energy Systems	4 CR
M-ETIT-100383	Seminar on Selected Chapters of Biomedical Engineering	3 CR
M-INFO-101175	Software Engineering I	6 CR
M-INFO-100833	Software Engineering II	6 CR
M-MACH-106378	Fluid Mechanics	7 CR
M-ETIT-106684	Superconducting Magnet Technology <i>First usage possible from 4/1/2024.</i>	4 CR
M-ETIT-106683	Superconducting Power Systems <i>First usage possible from 4/1/2024.</i>	4 CR
M-ETIT-105299	Superconductors for Energy Applications	5 CR
M-MACH-106054	Systematic Materials Selection	4 CR
M-ETIT-106474	Systems Engineering and AI-Methods	6 CR
M-MACH-102386	Technical Thermodynamics and Heat Transfer I	8 CR
M-MACH-102830	Technical Thermodynamics and Heat Transfer II	7 CR
M-ETIT-102104	Theory of Probability	5 CR
M-MACH-102567	Material Science and Engineering	9 CR
M-MACH-105369	Scientific Computing for Engineers	4 CR

9.6 Interdisciplinary Qualifications

Credits

4

Mandatory	
M-MACH-106583	Key Competences

9.7 Additional Examinations

Additional Examinations (Election: at most 30 credits)		
M-MACH-106439	Further Examinations	30 CR
M-ZAK-106099	Supplementary Studies on Sustainable Development	19 CR
M-ZAK-106235	Supplementary Studies on Culture and Society	22 CR

9.8 Master's Transfer Account

Election notes

Please note: Upon successful completion of all studies and exams needed for the bachelor's degree, a control of success registered as a prior master's examination may only be passed as long as you are enrolled in the bachelor's program. You should not yet have been admitted to the master's program and the master's semester should not yet have started.

This means that as soon as your admission to the master's program has been expressed and the master's semester has started, your participation in the examination is the **first regular examination** attempt within the framework of your master's studies.

Master Transfer Account (Election: at most 30 credits)		
M-MACH-102698	Actuators and Sensors in Nanotechnology	4 CR
M-MACH-102714	Microenergy Technologies	4 CR
M-ETIT-106670	Medical Imaging Technology II <i>First usage possible from 4/1/2024.</i>	3 CR

Modelled Conditions

The following conditions have to be fulfilled:

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

10 Modules

M

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

Responsible: Prof. Dr.-Ing. Rainer Stiefelhagen

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

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

T-INFO-101301	Accessibility - Assistive Technologies for Visually Impaired Persons	3 CR	Stiefelhagen
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M**10.2 Module: Actuators and Sensors in Nanotechnology [M-MACH-102698]**

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

Part of: [Master's Transfer Account](#)

Credits 4	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 4	Version 2
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Mandatory	
T-MACH-105238	Actuators and Sensors in Nanotechnology

Competence Certificate

oral exam: 45 min

Prerequisites

keine

Competence Goal

The students can:

- describe the principles of actuation and sensing and exemplify them
- describe important nano fabrication technologies and assess the influence of process parameters
- illustrate the layout and function of nano actuators and sensors and determine their characteristic properties (time constants, sensitivities, forces, etc.)
- evaluate their suitability for specific applications

Content

- Physical principles of actuation and sensing
- Scaling and size effects
- Fabrication technologies
- Selected developments
- Applications

The lecture includes amongst others the following topics:

- Nano technologies
- Nano electro mechanical systems (NEMS)
- Nano magneto mechanical and multiferroic systems
- Polymer-based nano actuators
- Nano motors, molecular systems
- Adaptive nano optical systems
- Nanosensors: concepts, materials, fabrication
- Examples on different categories of materials and applications:
- C-based, MeOx-based nano sensors
- Physical, chemical, biological nano sensors
- Multivariate data analysis / interpretation

Module grade calculation

Module grade calculation

The module grade is the grade of the written exam.

Workload

Time of attendance: $15 * 1,5 \text{ h} = 22,5 \text{ h}$

Preparation and follow up: $15 * 5,5 \text{ h} = 82,5 \text{ h}$

Exam Preparation and Exam: 15 h

Total: $120 \text{ h} = 4 \text{ LP}$

Recommendation

The lecture addresses students in the fields of mechanical engineering, mechatronics and information technology, materials science and engineering, physics, electrical engineering and economic sciences. A comprehensive introduction is given in the basics and current developments on the nanoscopic length scale.

Literature

- Lecture notes
- 2. Balzani, V., Credi, A., & Venturi, M., Molecular devices and machines: concepts and perspectives for the nanoworld, 2008
- „Nanowires and Nanobelts, - Materials, Properties and Devices -, Volume 2: Nanowires and Nanobelts of Functional Materials“, Edited by Zhong Lin Wang, Springer, 2003, ISBN 10 0-387-28706-X
- „Sensors Based on Nanostructured Materials“, Edited by Francisco J. Arregui, Springer, 2009, ISBN: 978-0-387-77752-8
- “Multivariate Datenanalyse – Methodik und Anwendungen in der Chemie”, R. Henrion, G. Henrion, Springer 1994, ISBN 3-540-58188-X

M**10.3 Module: Advanced Mathematics [M-MATH-102859]**

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

Credits 21	Grading scale Grade to a tenth	Duration 3 terms	Language German	Level 1	Version 1
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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-requisites). A "pass" result on a pre-requisites 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. They 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**10.4 Module: Algorithms I [M-INFO-100030]**

Responsible: TT-Prof. Dr. Thomas Bläsius

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits
6

Grading scale
Grade to a tenth

Recurrence
Each summer term

Duration
1 term

Language
German

Level
2

Version
1

Mandatory

T-INFO-100001	Algorithms I	6 CR	Bläsius
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M**10.5 Module: Bachelor's Thesis [M-MACH-106579]**

Responsible: Prof. Dr.-Ing. Marcus Geimer
Organisation: KIT Department of Electrical Engineering and Information Technology
 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-113253	Bachelor's Thesis	12 CR	Geimer
T-MACH-113254	Presentation	3 CR	Geimer

Competence Certificate

The module Bachelor Thesis consists of a written elaboration (Bachelor Thesis) and an oral presentation of a self-chosen or given scientific topic. The students should show that they are able to work on a problem from their field of study independently and in a limited time according to scientific methods.

The date of the issue of the topic of the Bachelor's Thesis is to be recorded by the supervisor and the student and made a record of it at the Examination Board. The topic can only be returned once and only within the first month of the processing period. The Examination Board determines the languages in which the Bachelor's Thesis can be written.

The scope of the module Bachelor Thesis corresponds to 15 credit points (written elaboration 12 LP, oral presentation 3 LP). The topic and task must be adapted to the planned workload. For example, if the student works 30 hours per week, the thesis should be ready for submission after 12 weeks.

The maximum processing time is 6 months. The presentation must take place within the maximum processing time, but no later than six weeks after submission of the Bachelor Thesis. Upon justified application by the student, the Examination Board may extend the processing time by a maximum of one month. If the Bachelor's Thesis is not handed in on time, it is considered to be graded as "failed" (5.0), unless the student is not responsible for this failure.

The Bachelor Thesis is evaluated by at least one professor at KIT or a habilitated member of the KIT Department of Electrical Engineering and Information Technology or a habilitated member of the KIT Department of Mechanical Engineering and one further examiner. As a rule, one of the examiners is the person who assigned the thesis. In case of disagreement between these two persons, the Examination Board determines the grade of the Bachelor Thesis within the framework of the evaluation of these two persons; it may also appoint another examiner. The assessment must be made within six weeks after submission of the Bachelor Thesis.

Prerequisites

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

Modeled Conditions

The following conditions have to be fulfilled:

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

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.

Workload

450 hours

Learning type

Bachelor Thesis and presentation

M**10.6 Module: Basic Electronic Circuits Laboratory [M-ETIT-102113]**

Responsible: Dr.-Ing. Armin Teltschik
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 6	Grading scale pass/fail	Recurrence Each summer term	Duration 1 term	Language German	Level 2	Version 4
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Mandatory	
T-ETIT-101943	Basic Electronic Circuits Laboratory

Competence Certificate

The success control takes place in the form of an oral final colloquium of approximately 20 minutes duration and during the internship by checking the completed test tasks. To participate in the final colloque, at least 8 of the 9 attempts must be successfully completed. The successfully carried out experiments together with the final colloquium form an examination unit. If you fail, the internship must be repeated completely. The event is not graded.

Prerequisites

Knowledge of the contents of the following modules ist necessary: „M-ETIT-102102 – Digitaltechnik“ and „M-ETIT-104465 – Elektronische Schaltungen“.

Competence Goal

The students learn how to use typical electrical engineering laboratory equipment (e.g. multimeter, function generator, oscilloscope). Measuring devices are used in practical tests. The students deepen the already learned basics of electronic circuit technology and digital technology in practice. You will learn how to use the associated measurement, analysis and simulation tools and will be familiarized with the interpretation of data sheets.

Content

Tests are carried out in the following areas:

- oscilloscope measurement technology,
- Operational amplifiers: basic circuits, arithmetic circuits, Fourier / analysis & synthesis
- Measurement technology with LabVIEW
- Circuit simulation with SPICE
- Small signal behavior of bipolar transistors
- AC voltage, small transformers, rectifiers, linear regulators
- digital technology, machine design, Detection of runtime errors
- DC chopper

Module grade calculation

The event is not graded.

Annotation

To participate in the final colloque, at least 8 of the 9 attempts must be successfully completed. The successfully carried out experiments together with the final colloquium form an examination unit. If you fail, the internship must be repeated completely.

Workload

Workload (for a lecture)

Attendance time in the internship: 36 h

Preparation / follow-up of the same: 63/36 h

Exam preparation and attendance yourself: 20 h

M**10.7 Module: Basics of Manufacturing Technology [M-MACH-106535]**

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

Part of: [Engineering Fundamentals](#)

Credits 3	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory	
T-MACH-112928	Basics of Manufacturing Technology

Competence Certificate
written exam (duration: 60 min)

Prerequisites
none

Competence Goal
The students ...

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

Content

The objective of the module 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 module conveys the basic principles of manufacturing technology and deals with the manufacturing processes based on example components according to their classification into main groups regarding technical and economic aspects. Regard is paid to classic manufacturing processes as well as new developments like additive manufacturing processes.

The following topics will be covered:

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

Workload

regular attendance: 30 hours
self-study: 60 hours

Learning type
Lecture, exercise

M**10.8 Module: Battery Modeling in MATLAB [M-ETIT-103271]**

Responsible: Dr.-Ing. Andre Weber

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

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

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

none

M**10.9 Module: CAE-Workshop [M-MACH-102684]**

Responsible: Prof. Dr.-Ing. Albert Albers

Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 4	Grading scale Grade to a tenth	Recurrence Each term	Duration 1 term	Language German	Level 2	Version 3
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Mandatory

T-MACH-105212	CAE-Workshop	4 CR	Albers, Matthiesen
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Competence Certificate

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

Prerequisites

None

Competence Goal

The students are able to ...

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

Content

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

Workload

regular attendance: 31.5 h

self-study: 88,5 h

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

discussing and presenting results in small groups

Learning type

Seminar

Literature

The workshop script will be allocated at Ilias.

M**10.10 Module: Communications Engineering II [M-ETIT-105274]****Responsible:** Dr.-Ing. Holger Jäkel

Prof. Dr.-Ing. Laurent Schmalen

Organisation: KIT Department of Electrical Engineering and Information Technology**Part of:** Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 4	Grading scale Grade to a tenth	Recurrence Each term	Duration 1 term	Language German/English	Level 2	Version 1
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Mandatory

T-ETIT-110697	Communications Engineering II	4 CR	Jäkel, Schmalen
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Competence Certificate

The assessment will be carried out in the form of a written exam of 120 minutes.

Prerequisites

none

Competence Goal

The students are able to analyze even more complex problems in communications engineering. You can independently develop and validate solutions and use problem-solving software. The transfer of the learned methods enables the students to quickly grasp other topics and to work on them with the appropriate methodological knowledge.

Content

The course broadens the questions dealt with in the lecture Communication Engineering I. The focus here is on the detailed analysis of known algorithms and the introduction of new methods that were not discussed in the lecture Communications Engineering I, especially in the areas of system and channel modeling, equalization and synchronization.

Module grade calculation

The module grade is the grade of the written exam.

Annotation

The module can be started for the first time in summer term 2020. Please note: The German course "Nachrichtentechnik II" takes place every summer term (starting summer term 2020) and the English version "Communications Engineering II" takes place every winter term (starting winter term 2020/2021).

Workload

1. Attendance Lecture: $15 * 2 \text{ h} = 30 \text{ h}$
 2. Preparation / Postprocessing Lecture: $15 * 4 \text{ h} = 60 \text{ h}$
 3. Presence Exercise: $15 * 1 \text{ h} = 15 \text{ h}$
 4. Preparation / follow-up Exercise: $15 * 2 \text{ h} = 30 \text{ h}$
 5. Exam preparation and presence in the same: charged in preparation / follow-up
- Total: $135 \text{ h} = 4 \text{ LP}$

Recommendation

Knowledge of basic engineering mathematics including integral transformations and probability theory as well as basic knowledge of communications engineering.

Previous visit to the lecture "Communications Engineering I", "Probability Theory" and "Signals and Systems" is recommended.

M**10.11 Module: Computer Organization [M-INFO-103179]****Responsible:** Prof. Dr. Wolfgang Karl**Organisation:** KIT Department of Informatics**Part of:** Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 6	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory			
T-INFO-103531	Computer Organization	6 CR	Karl

M**10.12 Module: Electric Energy Systems [M-ETIT-106337]**

Responsible: Prof. Dr.-Ing. Marc Hiller
Prof. Dr.-Ing. Thomas Leibfried

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [Engineering Fundamentals](#)

Credits 6	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory			
T-ETIT-112850	Electric Energy Systems	6 CR	Hiller, Leibfried

Prerequisites

none

M**10.13 Module: Electric Energy Systems [M-ETIT-102156]**

Responsible: Prof. Dr.-Ing. Thomas Leibfried

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 5	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory						
T-ETIT-101923	Electric Energy Systems			5 CR	Leibfried	

Competence Certificate

Success is assessed by means of an overall written examination lasting 120 minutes on the selected course.

Prerequisites

none

Competence Goal

Students are able to calculate electrical circuits (passive or with controlled sources) in the time and frequency range. They are also familiar with the most important network equipment, its physical mode of operation and its electrical equivalent circuit.

Content

The first part of the lecture deals with the calculation of balancing processes in linear electrical networks using differential equations and the Laplace transformation. The second part of the lecture deals with electrical network resources.

Module grade calculation

The module grade is the grade of the written examination.

Annotation

The associated course "Elektroenergiesysteme" will be offered for the last time in summer semester 2024. From summer semester 2025, the content will be taught in the course "Elektrische Energietechnik".

Workload

Attendance time lecture: 30 h

Exercise attendance time: 15 h

Self-study time: 90 h

Exam preparation and attendance in the same: integrated in self-study time

Total 135 h = 5 LP

M**10.14 Module: Electromagnetic Fields [M-ETIT-106419]**

Responsible: Prof. Dr. Martin Doppelbauer
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: [Engineering Fundamentals](#)

Credits 4	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory	
T-ETIT-113004	Electromagnetic Fields

Competence Goal

The aim is to convey the theoretical basics of electric, magnetic and electromagnetic fields based on the Max-well equations. The students can calculate electromagnetic fields of simple arrangements of charges and current-carrying conductors analytically using Maxwell's equations, sketch field images and derive the forces and powers that occur from them. You can take into account the influence of dielectrics and ferromagnetic materials.

Content

Introduction to the electromagnetic field theory based on Maxwell's equations. Electrostatic fields, electric flow fields, magnetic fields and fields that change slowly over time are treated:

- Mathematical foundations of field theory
- Fundamentals of electromagnetic fields
- Electrostatic fields
- Electric flow fields
- Magnetic fields
- Quasi-stationary (slowly changing over time) fields

Accompanying the lecture, exercises on the lecture material are provided. These are discussed in a large hall exercise and the associated solutions are presented in detail. In addition, tutorials are offered in small groups. The documents for the course (script and collection of formulas) can be found in the ILIAS system. You can register for the course without a password.

Annotation

This module lasts only until the end of December/beginning of January.

For the rest of the semester it is followed by the module "Electromagnetic Waves", which can be chosen by BSc MIT students in the specialization subject.

Workload

The workload is divided as follows:

- Attendance time in lectures (1.5 h per 15 dates) and tutorials (1.5 h per 9 dates) = 36 h
- Attendance time in tutorials = 7 weeks each 2.5 h = 17.5 h
- Preparation and wrap-up of the material = 7 weeks each 3 h = 21 h
- Exam preparation and presence in the exam: 2 weeks each 23 h = 46 h

Total effort approx. 120 hours = 4 ECTS

Recommendation

General physical and mathematical basics from the basic courses of the first semester.

M**10.15 Module: Electromagnetic Waves [M-ETIT-106471]**

Responsible: Prof. Dr.-Ing. Sebastian Randel
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 1: Electrical Engineering and Information Technology)
Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 3	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 2
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Mandatory	
T-ETIT-113084	Electromagnetic Waves

Competence Certificate

The success control takes place in the form of a written exam lasting 60 minutes.

Prerequisites

One of the modules:

- "M-ETIT-106419 - Elektromagnetische Felder" or
- "M-ETIT-104428 - Elektromagnetische Felder"

must have been started.

Modeled Conditions

You have to fulfill one of 2 conditions:

1. The module **M-ETIT-106419 - Electromagnetic Fields** must have been started.
2. The module M-ETIT-104428 - Electromagnetic Fields must have been started.

Competence Goal

Qualifications in the field of electromagnetic waves are acquired. The students are able to carry out calculations of electromagnetic wave phenomena and to use the necessary tools for this in a methodically appropriate manner. The students have gained an understanding of the physical relationships and can develop solution approaches for fundamental tasks. With the help of the methodology they have learned, they are able to understand the content of lectures with technical applications.

Content

Introduction to the theory of electromagnetic waves based on Maxwell's equations. The following topics are covered:

- Displacement current density
- The wave equation
- Plane waves in a non-conducting medium
- Reflection and refraction of plane waves
- Reflection at a conductor surface; the skin effect
- Harmonic waves
- Linear and circular polarized waves
- Solution methods for potential problems
- Separation of the scalar wave equation
- Waveguide (waveguide, optical fiber)
- The Hertzian dipole

Accompanying the lecture, exercises will be given on the lecture material. These will be discussed in a large hall exercise and the associated solutions presented in detail.

Additionally, tutorials in small groups are offered.

The course material (script and formulary) can be found in the ILIAS system. Registration for the course can be done without a password.

Module grade calculation

The module grade is the grade of the written exam.

Annotation

This module does not start until late December/early January.

Before that, the module "Electromagnetic Fields" is offered, which is mandatory for students of the BSc MIT.

Workload

The workload is divided as follows:

- Attendance time in lectures (1.5 h per 7 dates) and tutorials (1.5 h per 6 dates) = 19.5 h
- Attendance time in tutorials = 6 weeks each 2.5 h = 15 h
- Preparation and wrap-up of the material = 6 weeks each 3 h = 18 h
- Exam preparation and presence in the exam: 2 weeks each 18 h = 36 h

Total effort approx. 90 hours = 3 ECTS

Recommendation

General physical and mathematical basics from the basic courses of the first semester.

M**10.16 Module: Electronic Devices and Circuits [M-ETIT-104465]**

Responsible: Prof. Dr.-Ing. Ahmet Cagri Ulusoy

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [Engineering Fundamentals](#)

Credits 7	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 1	Version 2
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Mandatory						
T-ETIT-109318	Electronic Devices and Circuits			6 CR	Ulusoy	
T-ETIT-109138	Electronic Devices and Circuits - Workshop			1 CR	Zwick	

Competence Certificate

The assessment of the module consists of

1. a written examination of 120 minutes on the course Electronic Devices and Circuits (6 CP).
2. a written paper on the course Electronic Devices and Circuits - Workshop (1 CP). The written paper is corrected and awarded points. If the required number of points is achieved, the workshop is deemed to have been passed.

Prerequisites

None

Competence Goal

Students will be able to analyze and evaluate the functions and modes of operation of diodes, Z-diodes, bipolar and field-effect transistors, analog basic circuits, from single-stage amplifiers to operational amplifiers. The knowledge acquired about component parameters and the function of the components enables students to analyze and calculate various amplifier circuits. By acquiring knowledge of small signal models of the components, students can apply their theoretical knowledge to the practical design of circuits. In addition, students acquire advanced knowledge of the circuit design and applications of all basic digital elements (inverters, NAND, NOR, tri-state inverters and transmission gates) as well as circuits for use in sequential logic, such as flip-flops. This knowledge allows students to critically follow and analyze current trends in semiconductor development. In this way, students are enabled to analyze and, if necessary, independently optimize modern electrical systems from signal acquisition (sensor, detector) to signal conditioning (amplifier, filter, etc.).

In the workshop, students learn how to coordinate a project in small teams and how to present the results in the form of technical documentation. They will also be able to implement and characterize simple electronic transistor circuits.

Content

Basic lecture on passive and active electronic components and circuits for analog and digital applications.

The focus is on the design and circuit implementation of analog amplifier circuits with bipolar and field-effect transistors, the circuit design of simple logic elements for complex logic circuits. The following topics are covered in detail:

- Introduction (designations, terms)
- Passive components (R, C, L)
- Semiconductor components (diodes, transistors)
- Diodes
- Bipolar transistors
- Field-effect transistors (JFET, MOSFET, CMOS), properties and applications
- Amplifier circuits with transistors
- Properties of operational amplifiers
- Toggle circuits
- Sequential logic

The lecture is accompanied by exercises on the lecture material. These are discussed in a large classroom exercise and the corresponding solutions are presented in detail. Parallel to this, further exercises and lecture content will be set and solved in the form of dedicated tutorials in small groups to practice and deepen the course content.

The workshop takes up many of these focal points. Different sensors will be analyzed. In addition to the general functionality and theory of temperature, light or pressure sensors, suitable electronics are examined in order to convert the physical variables into a proportional, evaluable variable such as voltage or current. Simple sensor principles are dealt with in order to adapt the necessary prior knowledge for carrying out the experiment to the semester. Temperature-dependent resistors are used for temperature measurement or pn junctions are investigated. Applications for brightness measurement are realized with LEDs, photodiodes and phototransistors. Independent experiments are carried out as follows: Understanding sensor principle, design of evaluation circuits for the sensor signal, simulation of circuits in LTSpice, construction and comparison of circuits and evaluation with the µController board.

Module grade calculation

The module grade is made up of the grade of the written examination.

Workload

The preparation (0.5 h), attendance (1.5 h) and follow-up (2 h) of the weekly lecture, the 14-day tutorial and the six tutorial sessions as well as the preparation (82 h) and participation (2 h) in the written examination result in a total workload of approx. 180 h for the course Electronic Devices and Circuits, i.e. 6 CP.

The workload of the workshop is made up as follows:

1. Attendance time in the preparatory course incl. follow-up: 2 h
2. Working on the assignment: 23 h
3. Preparation of the written paper (protocol): 5 h

The time required for the workshop is approximately 30 hours. This corresponds to 1 CP.

Recommendation

Successful completion of the course "Linear Electrical Circuits" is recommended.

M**10.17 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: [Engineering Fundamentals](#)

Credits 21	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 3 terms	Language German	Level 1	Version 1
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Mandatory						
T-MACH-112904	Engineering Mechanics I		6 CR	Böhlke, Langhoff		
T-MACH-112907	Tutorial Engineering Mechanics I <i>This item will not influence the grade calculation of this parent.</i>		1 CR	Böhlke, Langhoff		
T-MACH-112905	Engineering Mechanics II		6 CR	Böhlke, Langhoff		
T-MACH-112908	Tutorial Engineering Mechanics II <i>This item will not influence the grade calculation of this parent.</i>		1 CR	Böhlke, Langhoff		
T-MACH-112906	Engineering Mechanics III		6 CR	N.N., Proppe		
T-MACH-112909	Tutorial Engineering Mechanics III <i>This item will not influence the grade calculation of this parent.</i>		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 undefeatable 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**10.18 Module: Fluid Mechanics [M-MACH-106378]**

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

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

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

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 Theorie der Strömungen, Springer-Verlag

M

10.19 Module: Fluid Mechanics and Technical Thermodynamics and Heat Transfer I [M-MACH-106668]

Responsible: Prof. Dr.-Ing. Bettina Frohnapfel
Prof. Dr. Ulrich Maas

Organisation:

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 2: Mechanical Engineering) (Usage from 10/1/2023)

Credits 14	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 2 terms	Language German	Level 2	Version 1
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Mandatory						
T-MACH-112933	Fluid Mechanics		7 CR	Frohnapfel		
T-MACH-112912	Technical Thermodynamics and Heat Transfer I		6 CR	Maas		
T-MACH-112910	Tutorial Technical Thermodynamics and Heat Transfer I		1 CR	Maas		

Competence Certificate

Written exams

Prerequisites

none

Modeled Conditions

The following conditions have to be fulfilled:

1. The module M-MACH-106378 - Fluid Mechanics must not have been started.
2. The module M-MACH-102386 - Technical Thermodynamics and Heat Transfer I must not have been started.

Competence Goal

Fluid Mechanics

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

Technical Thermodynamics and Heat Transfer I

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.

Content**Fluid Mechanics**

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.

Technical Thermodynamics and Heat Transfer 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

Module grade calculation

Grade of exam

Workload**Fluid Mechanics**

In presence: 90 hours

Self study time: 120 hours

Technical Thermodynamics and Heat Transfer I

Lectures and exercises: 75 h

Homework and preparation of examination: 135 h

Recommendation

none

Learning type

Lectures + tutorials

Literature**Fluid Mechanics**

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

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

Technical Thermodynamics and Heat Transfer I

Additional literature will be provided in the lecture.

M**10.20 Module: Fundamentals of Data Transmission [M-ETIT-106338]**

Responsible: Prof. Dr.-Ing. Laurent Schmalen
Prof. Dr.-Ing. Thomas Zwick

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 1: Electrical Engineering and Information Technology)
Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 6	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory						
T-ETIT-112851	Fundamentals of Data Transmission			6 CR	Schmalen, Zwick	

Competence Certificate

The success control takes place in the form of a written examination of 120 minutes.

Prerequisites

none

Competence Goal

The students can describe and analyze fundamental problems in the fields of high-frequency technology and communications engineering. By applying the methods they have learned, students can record and assess the processes in modern data transmission systems and compare the algorithms and techniques used with regard to their performance. This includes in particular the relationships between the physical signals in the analog part of the system and the resulting properties of the digital data transmission.

Content

This module aims to provide students with the basic theoretical and practical aspects of modern data transmission systems. Mainly the topics

- Channel capacity concept
- Line theory, reflection factor and power transmission
- Components (modulator/detector, mixer, amplifier, antenna) and systems
- Signal description in the bandpass range and in the equivalent lowpass range
- Modulation, demodulation and detection
- Calculation of error probabilities
- Higher quality modulation methods
- Basics of message coding

treated. The module thus provides an overview of different data transmission systems and how they work, from the physical signals to the performance (e.g. error rate) of the transmission

Module grade calculation

The module grade is the grade of the written examination.

Workload

Each credit point corresponds to approx. 30 hours of work (for students). This is based on average students who achieve an average performance. The workload includes (e.g. 4 SWS):

1. Presence time in lectures, exercises: $15 \times 4 \text{ h} = 60 \text{ h}$
2. Preparation/post-processing of the same: $25 \times 4 \text{ h} = 100 \text{ h}$
3. Exam preparation and presence in the same: 20 h

Total: 180 LP = 6 LP

Recommendation

Knowledge of physics, higher mathematics, probability theory, basics of electromagnetic waves, circuit technology, as well as signals and systems are helpful.

M**10.21 Module: Fundamentals of Digital Technology [M-ETIT-106407]**

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

Credits 4	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 1	Version 1
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Mandatory	
T-ETIT-112872	Fundamentals of Digital Technology

Competence Certificate

Success is checked in the form of a written exam lasting 80 minutes and by evaluating challenges. The challenges can be worked on independently by the students during the semester and submitted for evaluation.

Prerequisites

none

Competence Goal

The students:

- can name and assign the basic processes of digital technology and digital information processing with a focus on digital circuits.
- learn different coding and number representations including their arithmetic as a methodical basis of information processing systems.
- know the mathematical basics and can understand and apply graphic and algebraic processes for the design, analysis and optimization of digital circuits
- can convert a verbal task into a formal form and implement this in a technically optimized manner in the form of a switching network.
- get to know and correctly specify automata as a modeling tool for state and event-driven components.
- can mathematically correctly describe general data processing systems from vending machine specifications and implement them digitally in a suitable manner.

Content**Lecture (16 lecture units until end of Dezember/beginning of January)**

This lecture represents an introduction to important theoretical basics of digital technology, which is intended for students in the 1st semester. Since it cannot be based on knowledge of circuit technology, the focus is on abstract modeling of behavior and structures. In addition, the lecture should also convey the basics that are required in other lectures.

The focus of the lecture is the formal, methodical and mathematical basics for the design of digital systems. Building on this, the technical realization of digital systems is discussed.

At the beginning, the terms message and signal are specified, with binary signals being of particular importance. Various number representations and their arithmetic are presented as the basis of information processing systems. Some mathematical basics for set theory and for working with relations are conveyed in a compact manner. The formal basis of an algebraic treatment of digital technology is outlined in the form of switching algebra, which is presented extensively. As a technical realization of the switching algebra, building blocks of digital technology and in particular switching networks are considered, with their design, analysis and optimization being the main focus. Automata are introduced as a basis for modeling state and event-controlled digital systems

Exercise

Accompanying the lecture, exercises on the lecture material are given. These are discussed in a large hall exercise and the associated solutions are presented in detail. In addition, further exercises are provided in the form of dedicated tutorials in small groups, which are worked on independently with the support of a student tutor. The solution of practice-related problems related to digital technology is offered in the form of a blended learning concept interlocked with the lecture content.

Module grade calculation

The module grade is the grade of the written exam.

Annotation**This module lasts only until the end of December/beginning of January.**

For the rest of the semester it is followed by the module "Systems Modeling", which is recommended for BSc MIT students in their 1st or 3rd semester.

Workload

1. attendance time in 16 lectures and 4 exercises: $20 * 1,5 \text{ h} = 30 \text{ h}$
 2. preparation and follow-up of the same: 60 h (approx. 2h per unit)
 3. exam preparation and presence in the exam: = 20h + 1h
- Total: 111 h = 4 LP

M**10.22 Module: Further Examinations [M-MACH-106439]**

Organisation: KIT Department of Mechanical Engineering

Part of: Additional Examinations

Credits 30	Grading scale pass/fail	Recurrence Each term	Duration 2 terms	Language German	Level 3	Version 1
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Further Examinations (Election: at most 30 credits)			
T-MACH-106638	Wildcard Additional Examinations 1	3 CR	
T-MACH-106639	Wildcard Additional Examinations 2	3 CR	
T-MACH-106640	Wildcard Additional Examinations 3	3 CR	
T-MACH-106641	Wildcard Additional Examinations 4	3 CR	
T-MACH-106643	Wildcard Additional Examinations 5	3 CR	
T-MACH-106646	Wildcard Additional Examinations 6	3 CR	
T-MACH-106647	Wildcard Additional Examinations 7	3 CR	
T-MACH-106648	Wildcard Additional Examinations 8	3 CR	
T-MACH-106649	Wildcard Additional Examinations 9	3 CR	
T-MACH-106650	Wildcard Additional Examinations 10	3 CR	

Prerequisites

None

M**10.23 Module: Human Computer Interaction (24659) [M-INFO-100729]****Responsible:** Prof. Dr.-Ing. Michael Beigl**Organisation:** KIT Department of Informatics**Part of:** Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 6	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory			
T-INFO-101266	Human-Machine-Interaction	6 CR	Beigl
T-INFO-106257	Human-Machine-Interaction Pass	0 CR	Beigl

M**10.24 Module: Hybrid and Electric Vehicles [M-ETIT-100514]**

Responsible: Prof. Dr. Martin Doppelbauer
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 1: Electrical Engineering and Information Technology)
Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 4	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory	
T-ETIT-100784	Hybrid and Electric Vehicles

Competence Certificate

Success is assessed in the form of a written examination lasting 120 minutes.

Prerequisites

none

Competence Goal

Students understand the technical function of all drive components of hybrid and electric vehicles and their interaction in the drivetrain. They have detailed knowledge of the drive components, in particular batteries and fuel cells, power electronic circuits and electrical machines including the associated transmissions. They are also familiar with the most important drive topologies and their specific advantages and disadvantages. Students will be able to assess and evaluate the technical, economic and ecological effects of alternative drive technologies for motor vehicles.

Content

Based on the mobility needs of modern industrial society and the political framework conditions for climate protection, the different drive and charging concepts of battery-electric and hybrid-electric vehicles are presented and evaluated. The lecture gives an overview of the components of the electric drive train, in particular battery, charging circuit, DC/DC converter, inverter, electric machine and transmission. Outline:

- Hybrid vehicle drives
- Electric vehicle drives
- Driving resistances and energy consumption
- Operating strategy
- Energy storage
- Fundamentals of electrical machines
- Asynchronous machines
- Synchronous machines
- Special machines
- Power electronics
- Charging
- Environment
- Vehicle examples

Requirements and specifications

Module grade calculation

The module grade is the grade of the written examination.

Workload

14x lecture and 7x exercise 1.5 h each = 31.5 h

14x follow-up lecture à 1 h = 14 h

6x preparation for exercise à 2 h = 12 h

Exam preparation: = 50 h

Examination time = 2 h

Total = 109.5 h

(corresponds to 4 credit points)

Recommendation

To understand the module, basic knowledge of electrical engineering is recommended (acquired, for example, by attending the modules "Electrical Machines and Power Electronics", "Electrical Engineering for Industrial Engineers I+II" or "Electrical Engineering and Electronics for Mechanical Engineers").

M**10.25 Module: Image Processing [M-ETIT-102651]**

Responsible: Prof. Dr.-Ing. Michael Heizmann

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 3	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory	
T-ETIT-105566	Image Processing

Prerequisites

none

M**10.26 Module: Information and Automation Technology [M-ETIT-106336]**

Responsible: Prof. Dr.-Ing. Mike Barth

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [Engineering Fundamentals](#)

Credits 7	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 1	Version 2
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Mandatory			
T-ETIT-112878	Information and Automation Technology	5 CR	Barth
T-ETIT-112879	Information and Automation Technology - Lab Course	2 CR	Sax

Competence Certificate

1. The assessment of success takes the form of a written examination lasting 120 minutes. The module grade is the grade of the written exam.
2. A success check in the form of a coursework consisting of project documentation and checking the source code as part of the internship course

Prerequisites

None

Competence Goal

Students learn about the structure and functionality of information technology and automation systems, their architectures and their use.

The students:

- can name different programming languages and paradigms and compare their differences.
- know the components required to create an executable program and how they interact.
- know general computer architectures, their advantages and disadvantages as well as possibilities for increasing performance.
- know different ways of storing and organizing data in a structured way and can evaluate them.
- are able to explain the phases and processes of project management and can plan smaller projects.
- can apply modern methods and platforms for version management and describe the advantages and disadvantages.
- gain a basic understanding of current challenges in the engineering of (distributed) automation systems.
- are able to understand, apply and further develop the language tools of automation technology.
- are able to develop the architecture of an automation system with regard to communication, level and data flows.
- know basic information models of automation technology.

By participating in the practical course in information technology, students can break down complex programming problems into simple and clear modules and develop suitable algorithms and data structures, as well as convert these into an executable program using a programming language.

Content

Lecture

- Programming languages, program creation and program structures incl. object orientation
- Computer architectures
- data structures
- Project management
- Version management
- Theoretical and practical aspects of industrial automation technology.
- IEC61131-3 languages and program structure units
- Object-oriented aspects of control technology
- Live demos for control program design
- Deterministic systems for control technology
- Communication architectures and models
- AT architectures incl. modularization

Exercise

The exercise accompanies the lecture:

- teaches the basics of the C++ programming language. Exercises relating to the lecture material are set and the solutions are explained in detail. The focus is on the structure and analysis of programs and their creation.
- The basics of IEC 61131-3 control implementation are taught. Practical tasks are set and their solutions are discussed together. The focus is on the structure of control programs and their implementation and validation in real systems.

Practical course in information technology (6 sessions):

- The writing of complex C/C++ code sections and the use of an integrated development environment are practiced during the implementation in a structured and executable source code, in compliance with specified quality criteria. The implementation is carried out on a microcontroller board, which is already known from other courses. The project is carried out in small teams, which break down the overall project into individual tasks and work on them independently. The content of the lectures and exercises is taken up again and applied to specific problems. At the end of the practical course, each project team should demonstrate the successful completion of their work on the "Magni Silver Platform".

Module grade calculation

The module grade is the grade of the written exam.

Annotation**Attention:**

The partial performances assigned to this module are part of the orientation examination of the following study programs:

- Bachelor Elektrotechnik und Informationstechnik (SPO 2023, §8).

The examination is to be taken at the end of the 2nd semester. A repeat examination must be taken by the end of the 3rd semester.

Workload

1. Attendance time in lectures and exercises: $31 * 2 \text{ h} = 62 \text{ h}$
2. Preparation/post-processing of the same: 45 h
3. Internship 6 appointments = 12 h
4. Preparation/follow-up of the internship = 50 h
5. Exam preparation and presence in the same: = 40 h

Total: 209 h = 7 LP

Recommendation

- Knowledge of the basics of programming is recommended (attendance of the MINT course C++).
- The contents of the module "Digital Technology" or "Fundamentals of Digital Technology (and Systems Modeling)" are helpful.

M**10.27 Module: Internship [M-MACH-106582]**

Responsible: Prof. Dr. Martin Doppelbauer
 Prof. Dr.-Ing. Marcus Geimer

Organisation: KIT Department of Mechanical Engineering

Part of: Internship

Credits 15	Grading scale pass/fail	Recurrence Each term	Duration 1 term	Language German	Level 3	Version 1
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Mandatory						
T-MACH-113256	Internship			15 CR	Doppelbauer, Geimer	

Competence Certificate

During the bachelor's program, students are required to complete an internship of at least 13 weeks, which is suitable for giving students an insight into practical work in the field of mechatronics and information technology. 15 credit points are assigned to the professional internship.

For the recognition of the professional internship, a proof of activity (internship certificate) of the company with the type and duration of the internship and an internship report are submitted to the responsible internship office. Both documents must be confirmed by the company by signature. Company here stands synonymously for firms, companies, etc., which include a recognized training facility (but not, for example, a GbR).

The nature of the individual activities must be evident from the proof. In case of ambiguity, the trainee's certificate, the traineeship contract, or further evidence can also be requested in the original.

Prerequisites

None

Competence Goal

The bachelor's degree program in Mechatronics and Information Technology includes an internship as part of the curriculum.

Its aim is to introduce the student to the special work of an engineer by working on concrete, technical tasks. Subject-related knowledge from practice is to be acquired and further impressions of the later professional environment as well as the position and responsibility within the company are to be gathered. As far as possible, the internship should also provide an insight into the company's organization and management.

After their work placement, students will be able to

- describe the principles of organizational structure (e.g. organizational structures) and process organization (e.g. work planning and work control) in a company,
- perform complex technical tasks under realistic conditions
- apply key qualifications such as initiative, teamwork and communication skills in addition to their technical practical experience and abilities,
- describe the technical and interdisciplinary requirements in the individual's intended future field of activity and take this into account for future study planning.

Content

The activities in the internship must correspond in content to those of an engineer. The activities can be chosen from the following areas:

- Industrial research and development,
- Design and work preparation,
- Assembly and commissioning,
- Production planning and control,
- maintenance, repair and servicing,
- Calculation, modeling and simulation,
- test planning, execution and evaluation,
- project and planning tasks,
- engineering services,
- other discipline-related complex activities (projects) according to the chosen specialization.

At least two different areas from these fields should be demonstrated. Activities from the field of a skilled worker are not recognized as a specialized internship.

Professional internships in higher education institutions are excluded.

Annotation

Further information are provided by the internship guidelines for the bachelor's degree program in Mechatronics and Information Technology.

Workload

450 hours

Learning type

Internship

M**10.28 Module: Introduction to High Voltage Engineering [M-ETIT-105276]**

Responsible: Dr.-Ing. Michael Suriyah

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 3	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory						
T-ETIT-110702	Introduction to High Voltage Engineering			3 CR	Suriyah	

Competence Certificate

Oral exam approx. 20 minutes.

Competence Goal

The students know the causes of overvoltages in electric power systems.

The students are familiar with the main components and measuring equipments used in high voltage systems.

The students are able to differentiate between the various methods to measure high voltages.

The students know the necessary steps to construct and build up a high voltage test circuit.

The students are familiar with relevant methods used to diagnose electrical insulating materials and systems.

Content

The integration of renewable energies into the existing grid is a huge challenge in terms of ensuring a stable and secure energy supply. High-voltage technology is a key technology to make the energy transition a success. In addition to the conventional three-phase transmission, high-voltage direct current (HVDC) transmission is becoming more and more important in Germany as part of network expansion of transmission grids. The aim of this event is to comprehensively convey and discuss new findings in the field of high voltage engineering. New materials and test methods for insulation systems and products are of particular importance.

Topics:

1. Materials of high voltage engineering
2. Equipment of electrical power engineering
3. Methods of high-voltage measurement technology
4. Monitoring, diagnostics and condition assessment of resources
5. Guest lecture from the industry

Module grade calculation

The module grade is the grade of the oral exam.

Workload

The workload includes:

Presence time in lecture (30 h = 1 LP)

Self-study time (60 h = 2 LP)

Total (90 h = 3 LP)

Recommendation

Basic knowledge in network theory, field theory and electrical metrology

M**10.29 Module: Introduction to Operations Research (WW1OR) [M-WIWI-101418]**

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

Organisation: KIT Department of Economics and Management

Part of: [Specialization in Mechatronics \(Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management\)](#)

Credits 9	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 2 terms	Language German	Level 2	Version 2
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Mandatory	
T-WIWI-102758	Introduction to Operations Research I and II

Competence Certificate

The assessment of the module is carried out by a written examination (120 minutes). In each term (usually in March and August), one examination is held for both courses.

Prerequisites

None

Competence Goal

The student

- names and describes basic notions of the essential topics in Operations Research (Linear programming, graphs and networks, integer and combinatorial optimization, nonlinear programming, dynamic programming and stochastic models),
- knows the indispensable methods and models for quantitative analysis,
- models and classifies optimization problems and chooses the appropriate solution methods to solve optimization problems independently,
- validates, illustrates and interprets the obtained solutions.

Content

This module treats the following topics: linear programming, network models, integer programming, nonlinear programming, dynamic programming, queuing theory, heuristic models.

This module forms the basis of a series of advanced lectures with a focus on both theoretical and practical aspects of Operations Research.

Module grade calculation

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

Workload

The total workload for this module is approx. 270 hours (attendance time: 85 hours, other time for preparation and follow-up as well as exam preparation: 185 hours, 9 credit points). The total number of hours per course results from the time spent attending the lectures and exercises, as well as the examination times and the time required for an average student to achieve the learning objectives of the module.

M**10.30 Module: Introduction to Video Analysis (24684) [M-INFO-100736]****Responsible:** Prof. Dr.-Ing. Jürgen Beyerer**Organisation:** KIT Department of Informatics**Part of:** Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)**Credits**
3**Grading scale**
Grade to a tenth**Recurrence**
Each summer term**Duration**
1 term**Language**
German**Level**
2**Version**
1**Mandatory**

T-INFO-101273	Introduction to Video Analysis	3 CR	Beyerer
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M**10.31 Module: Key Competences [M-MACH-106583]**

Responsible: Prof. Dr.-Ing. Marcus Geimer
Organisation: KIT Department of Mechanical Engineering
Part of: [Interdisciplinary Qualifications](#)

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

In the module Key Competences, one course each is taken in the elective block "Technology Ethics" and in the elective block "Key Competences".

Engineering Ethics (Election: 1 item)			
T-ETIT-111923	Ethics of Technology - ARs ReflecTlons	2 CR	Kühler
T-GEISTSOZ-111509	Philosophy of Technology Assessment - Proseminar	3 CR	
T-GEISTSOZ-111511	Normative Aspects of Technology Assessment - Limits and Possibilities of a (Prospective) Technology Assessment - Advanced Seminar	3 CR	Hillerbrand
Key Competence (Election: 1 item)			
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

Depending on the selected offer

Prerequisites

None

Content

Depending on the selected offer

Module grade calculation

ungraded

Workload

Depending on the selected offer

M**10.32 Module: Laboratory Circuit Design [M-ETIT-100518]**

Responsible: Prof. Dr.-Ing. Jürgen Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 6	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 2
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Mandatory	
T-ETIT-100788	Laboratory Circuit Design

Prerequisites

none

Competence Goal

The practical course teaches necessary knowledge and abilities to design electric circuits as used to interface microcontrollers/FPGAs with sensors and actors. At the end of this course the participants are capable of selecting electronic components based on relevant criteria, combining them to basic building blocks, and setting up a working system for a given problem. In addition to circuit design, basic methods and abilities for the creation of PCB layouts are taught. Finally, the participants are enabled to assemble and test their designed circuits in real setups.

Content

This course is a three-week practical block event. Its goal is the development and setup of the complete electronics used to run a self-balancing single-axis transportation device.

The first part of the course covers commonly used electric circuits which are presented in interactive lecture style. This covers circuits for voltage supply, clock generation, sensor signal pre-processing, power drivers, and display control, among others. Real-world components are presented based on their datasheets. To consolidate this knowledge, the lecture is interwoven with small practical exercises where students set up and experiment with the presented circuits. This first part aims at refreshing basic knowledge from previous courses as well as imparting knowledge on often-used basic circuits.

After presenting the basic circuits there is a short presentation on PCB layout design. This part comprises an introduction of the PCB layout tool used in the course, followed by tips on placement and wiring of components on the PCB. It covers the topics of noise and crosstalk reduction, placement of bypass capacitors, and ground design.

During the third and longest part of the course, the participants work in teams to create a concept, schematics, and layouts of circuit parts to run the transportation device. Requirements are given concerning the functionality of the circuit parts as well as interfaces to neighboring parts only. All further development steps are carried out by the students themselves, based on the knowledge from the first two parts of the course.

Workload

The workload includes

1. presence in the laboratory: 15 days of 8h each = 120h
2. course preparation/recapitulation: 15 days of 2h each = 30h
3. exam preparation and attendance: 15h

Recommendation

Basic knowledge on basic electrical circuits (e.g. courses LEN, Nr. 2305256, ES, Nr. 2312655 and EMS, Nr. 2306387)

M**10.33 Module: Laboratory for Applied Machine Learning Algorithms [M-ETIT-104823]**

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

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 1: Electrical Engineering and Information Technology)

Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 6	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 2
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Mandatory			
T-ETIT-109839	Laboratory for Applied Machine Learning Algorithms	6 CR	Becker, Sax, Stork

Competence Certificate

Type of examination: alternative exam assessment

The examination consists of written reports, assessment of team work, an oral presentation, and an oral exam at the end of the lecture period. The overall impression is rated.

M**10.34 Module: Laboratory Hardware and Software in Power Electronic Systems [M-ETIT-103263]**

Responsible: Prof. Dr.-Ing. Marc Hiller

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 6	Grading scale Grade to a tenth	Recurrence Each term	Duration 1 term	Language German	Level 2	Version 2
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Mandatory	
T-ETIT-106498	Laboratory Hardware and Software in Power Electronic Systems

Prerequisites

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

M**10.35 Module: Linear Electric Circuits [M-ETIT-106417]**

Responsible: Prof. Dr.-Ing. John Jelonnek
 Prof. Dr. Sebastian Kempf

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [Engineering Fundamentals](#)

Credits 8	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 1	Version 1
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Mandatory			
T-ETIT-113001	Linear Electronic Networks	6 CR	Jelonnek, Kempf
T-ETIT-109317	Linear Electronic Networks - Workshop A	1 CR	Leibfried, Lemmer
T-ETIT-109811	Linear Electronic Networks - Workshop B	1 CR	Nahm

Competence Certificate

The assessment of the entire module consists of three independent parts:

1. the contents of the Linear Electrical Circuits course (6 CP) are examined in a written examination lasting 120 minutes. Students who pass the examination can receive a grade bonus of up to 0.4 grade points if they have successfully completed two project tasks during the semester. Proof of completion of the project tasks is provided by submitting documentation or the project code within the processing period.
2. written report for the course Linear Electrical Circuits - Workshop A, (1 CP)
3. written report for the course Linear Electrical Circuits - Workshop B, (1 CP)

The following applies to both workshops: The written papers are corrected and awarded points. If the required number of points is achieved, the workshop is deemed to have been passed.

Competence Goal

In the Linear Electrical Circuits module, students acquire skills in the analysis and design of electrical circuits with linear components with direct current and alternating current. They will be able to recall and understand the topics and apply the methods covered in order to analyze electrical circuits with linear components and assess their relevance, correct function and properties.

In the workshop, students learn how to coordinate a project in small teams and how to present the results in the form of technical documentation. Furthermore, they are able to recognize basic simple problems from electrical engineering (e.g. measurement technology, analog circuit technology) and to develop practical and decision-relevant solutions.

Content

The following topics are covered in the course Linear Electrical Circuits:

- Methods for analyzing complex linear electrical circuits
- Definitions of U, I, R, L, C, independent sources, dependent sources
- Kirchhoff's equations, node potential method, mesh current method
- Substitute current source, substitute voltage source, star-delta transformation, power matching
- Operational amplifier, inverting amplifier, adder, voltage follower, non-inverting amplifier, differential amplifier
- Sinusoidal currents and voltages, differential equations for L and C, complex numbers
- Description of RLC circuits with complex numbers, impedance, complex power, power matching
- Bridge circuits, Wheatstone, Maxwell-Wien and Wien bridge circuits
- Series and parallel resonant circuits
- Four-pole theory, Z, Y and A matrix, impedance transformation, locus curves and Bode diagrams
- Transformer, mutual inductance, transformer equations, equivalent circuit diagrams of the transformer
- Three-phase current, power transmission and symmetrical load

In Workshop A, students are introduced to the current topic of renewable energy sources. For this purpose, a solar cell is used and various practical scenarios are realized with guidance in order to get to know the properties of photovoltaics and the advantages of an energy storage system. The task is to investigate the optimal utilization of renewable energy sources or the effects of shading on solar modules. In addition, a long-term experiment will introduce students to the basic functions of MATLAB and demonstrate the possibilities of a data logger.

In Workshop B, the students will be introduced to various circuits with operational amplifiers. The task ranges from literature research, simulation and experimental setup to measuring the real circuit and discussing the results. Simple basic circuits are considered, such as inverting and non-inverting amplifiers, differential amplifiers or RC and RL elements. In addition, active filters with operational amplifiers (low-pass/high-pass of higher order, RLC element) are constructed and characteristic curves such as the amplitude or phase response are evaluated.

Module grade calculation

The module grade corresponds to the grade for the Linear Electrical Circuits course. As described in the section "Competence Certificate", this is made up of the grade for the written examination Linear Electrical Circuits and any grade bonus received. In addition, passing both workshops is a prerequisite for passing the module.

Annotation**Attention:**

The partial achievements assigned to this module are part of the orientation examination of the following degree programs:

- Bachelor of Electrical Engineering and Information Technology (SPO 2023, §8)
- Bachelor of Mechatronics and Information Technology (SPO 2023, §8)
- Bachelor of Biomedical Engineering (SPO 2022, §8)

The examination must be taken at the end of the 2nd semester. A repeat examination must be taken by the end of the 3rd semester.

Workload

The workload of the course Linear Electrical Circuits includes

1. Attendance time in lectures, exercises 60 h
2. Preparation/follow-up 90 h
3. Exam preparation and attendance in the same 30 h

The time required is approximately 180 hours. This corresponds to 6 CP.

The workload of a workshop is made up as follows:

1. Attendance time in the preparatory event incl. follow-up: 2h
2. Working on the assignment: 23h
3. Preparation of the written report (minutes): 5h

The time required per workshop is approximately 30 hours. This corresponds to 1 CP each.

M**10.36 Module: Material Science and Engineering (CIW-MACH-01) [M-MACH-102567]**

Responsible: Dr.-Ing. Johannes Schneider

Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 2: Mechanical Engineering)
Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 9	Grading scale Grade to a tenth	Recurrence Each term	Duration 2 terms	Language German	Level 2	Version 1
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Mandatory

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

oral exam

Prerequisites

None

Competence Goal

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

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

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

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

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

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

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

Content

Atomic structure and atomic bonds

Structures of crystalline and amorphous solids

Defects in crystalline solids

Alloys

Transport and transformation phenomena in the solid state

Corrosion

Wear

Mechanical properties

Testing of materials

Ferrous materials

Non-ferrous metals and alloys

Polymers

Engineering ceramics

Composites

Module grade calculation

grade of the oral exam

Workload

regular attendance: 90 hours

self-study: 180 hours

Learning type

lectures and exercises

Literature

W. Bergmann: Werkstofftechnik I + II, Hanser Verlag, München, 2008/9

M. Merkel: Taschenbuch der Werkstoffe, Hanser Verlag, München, 2008

R. Schwab: Werkstoffkunde und Werkstoffprüfung für Dummies, Wiley VCH, Weinheim, 2011

J.F. Shackelford; Werkstofftechnologie für Ingenieure, Pearson Studium, München, 2008 (E-Book)

J.F. Shackelford; Introduction to Materials Science for Engineers. Prentice Hall, 2008

lecture notes and lab script

M**10.37 Module: Measurement and Control Technology [M-ETIT-106339]**

Responsible: Prof. Dr.-Ing. Michael Heizmann
Prof. Dr.-Ing. Sören Hohmann

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [Engineering Fundamentals](#)

Credits 6	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory						
T-ETIT-112852	Measurement and Control Technology			6 CR	Heizmann, Hohmann	

Competence Certificate

The success control takes place in the form of a written examination of 120 minutes.

Prerequisites

none

Competence Goal

- Students have a sound knowledge of the theoretical fundamentals of measurement technology, including scaling of measured quantities, the SI system of units, model building for measurement systems, description and treatment of systematic and stochastic measurement deviations, obtaining and linearizing measurement characteristics and propagation of measurement uncertainties.
- Students master the procedure for the basic design of measurement systems, taking into account the above knowledge.
- Students are able to analyze tasks in measurement technology, synthesize possible solutions for measurement systems and assess the properties of the solution obtained.
- The aim is to teach the basics of control engineering, therefore students are able to recognize and work on basic control engineering problems. They know the relevant technical terms.
- Students are able to formally describe real processes and to derive requirements for control structures in the time and image domain for fixed value and sequential control systems.
- Students are able to analyze the dynamics of systems using graphical and algebraic methods.
- Students will be able to name controller design methods for single-loop, single-variable systems. They will be able to design perfect closed-loop and open-loop control systems.
- They can perform design steps using the Nyquist criterion and the Wurzelortz curve.
- Students can name structures for disturbance compensation, of multi-loop control loops and two degrees of freedom structures and perform design steps for them.
- Students can digitize closed-loop and open-loop controls designed in the image domain using fast sampling design.
- Students are familiar with computer-aided design procedures and can carry out substeps in them.

Content

- Description of measured quantities
 - Metric quantities and their properties
 - SI system of units
- Structure of measuring systems
- Measurement deviations
 - Systematic and stochastic deviations
- Curve fitting
 - Interpolation
 - Approximation
- Characteristic curves and their errors
 - Linearization of characteristic curves
 - Treatment of disturbance variables
- Uncertainty propagation
 - Error propagation
 - Guide to the Expression of Uncertainty in Measurement (GUM)
- Basic concepts of control engineering
 - Control loops
 - Control structures
 - Embedding in automation structures
- Description of systems in time and image domain
 - State space representation
 - Derivation of an I/O representation
 - Signal flow diagrams and control loop elements
 - Realization of controllers (analog and digital)
- Analysis of control loops in time and image domain
 - Stationary accuracy
 - Stability
 - Dynamics (bandwidth)
 - Robustness
- Design of single loop control loops
 - Perfect control
 - Design with the Nyquist criterion
 - Root locus curve
 - Heuristics
- Design of extended control loop structures
 - disturbance compensation
 - Meshing
 - Two degrees of freedom structure

Module grade calculation

The module grade is the grade of the written exam.

Workload

Total approx. 180h, of which

Attendance time in lectures and exercises: 60h

Preparation and follow-up of the lectures and exercises: 60 hours

Exam preparation and presence in the same: 60h

Total: 180 LP = 6 LP

Recommendation

Knowledge of "Signale und Systeme" is helpful

M**10.38 Module: Mechanical Design A [M-MACH-106527]**

Responsible: Prof. Dr.-Ing. Tobias Düser
Prof. Dr.-Ing. Sven Matthiesen

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

Part of: [Engineering Fundamentals](#)

Credits 7	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 1	Version 3
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Mandatory	
T-MACH-112984	Mechanical Design A
T-MACH-112981	Mechanical Design A, Workshop

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

Module grade calculation

The module grade ist the grade of the written exam.

Annotation

None

Workload

MKL A: Total workload: 210 h, thereof attendance 75 h, divided into lecture + exercise: 4 SWS -> 60 h as well as workshop: 1 SWS -> 15 h; self-study 135 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**10.39 Module: Mechanical Design B-C [M-MACH-106528]**

Responsible: Prof. Dr.-Ing. Tobias Düser
Prof. Dr.-Ing. Sven Matthiesen

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

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 2: Mechanical Engineering)
Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 12	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 2 terms	Language German	Level 2	Version 1
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Mandatory			
T-MACH-112985	Mechanical Design B and C	6 CR	Matthiesen
T-MACH-112982	Mechanical Design B, Workshop	3 CR	Matthiesen
T-MACH-112983	Mechanical Design C, Workshop	3 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 B

- Design
- Tolerances & Fittings
- Gear Transmission
- Clutches

MD C

- Bolt connections
- Dimensioning
- Electric Motors + Hydraulics

Module grade calculation

The module grade ist the grade of the written exam.

Annotation

None

Workload

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**10.40 Module: Mechatronical Systems and Products [M-MACH-106493]**

Responsible: Prof. Dr.-Ing. Sören Hohmann
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: [Engineering Fundamentals](#)

Credits 7	Grading scale Grade to a tenth	Recurrence Each term	Duration 2 terms	Language German	Level 2	Version 1
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Mandatory						
T-MACH-112988	Mechatronical Systems and Products		3 CR	Hohmann, Matthiesen		
T-MACH-108680	Workshop Mechatronical Systems and Products		4 CR	Hohmann, Matthiesen		

Competence Certificate

The control of success takes place in the context of a written examination (60 minutes) and an examination achievement of other kind

Prerequisites

None

Competence Goal

The students

- can describe the difficulties of interdisciplinary project work
- can coordinate processes, structures, areas of responsibility and interfaces within a project
- know different mechanical/electrical options for action to solve problems
- know the elements of the product development processes (PEP) covered and can explain the different views of a PEP
- know the basic principles of virtualized design and can apply the methods for virtual system design
- can recognize differences between virtuality and reality
- can explain the advantages of early validation
- can understand and apply description forms of the bond graph and ESB
- can set up and analyze multidomain models
- can apply methods for identification of model parameters

Translated with www.DeepL.com/Translator (free version)

Content

The students will learn theoretical basics in the lecture, which they will apply and deepen in a development task. The development task will be worked on in small groups in which the students organize themselves and divide the tasks independently. In the project work - the workshop Mechatronic Systems and Products - they work on a development task in teams. In the process, they go through various development phases, from the formulation of technical solution concepts to the development and validation of virtual prototypes and physical functional prototypes.

Module grade calculation

The module grade is composed of equal parts of the grades of the partial performances of the module.

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.

Workload

The total workload for this unit is approximately 210 hours (7.0 credits).

Recommendation

It is recommended that this module not be taken concurrently with other time-consuming workshops.

Learning type

Lecture, exercise and project work

Literature

Janschek, Klaus (2010): Systementwurf mechatronischer Systeme. Methoden - Modelle - Konzepte. Berlin, Heidelberg: Springer
Matthiesen, Sven (2021): Gestaltung – Prozess und Methoden. In: Beate Bender und Kilian Gericke (Hg.): Pahl/Beitz Konstruktionslehre. Berlin, Heidelberg: Springer Berlin Heidelberg, S. 397–465.

Base for

None

M**10.41 Module: Medical Imaging Technology I [M-ETIT-106449]**

Responsible: Prof. Dr. Maria Francesca Spadea
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 3	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language English	Level 2	Version 1
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Mandatory	
T-ETIT-113048	Medical Imaging Technology I

Competence Certificate

The examination takes place in form of a written examination lasting 60 minutes.

Prerequisites

none

Competence Goal

For each imaging modality students will be able to:

- identify required energy source;
- analyze the interactions between the form of energy and biological tissue distinguishing desired signal from noise contribution;
- critically interpret the image content to derive knowledge
- evaluate image quality and implementing strategies to improve it.

Moreover, the students will be able to communicate in technical and clinical English language.

Content

The module Medical Imaging Technology I provides knowledge on

- the basic knowledge of mathematical and physical principles of medical imaging formation, including X-ray based modalities, nuclear medicine imaging, magnetic resonance imaging and ultrasound
- the component of medical imaging devices.
- assessment of image quality in terms of signal-to-noise-ratio, presence of artifact, spatial, spectral and temporal resolution
- safety and protection for patients and workers.

Module grade calculation

The module grade is the grade of the written exam.

Workload

1. attendance in lectures and exercises: 2SWS = 30 h
2. preparation / follow-up: 15*2 h = 30 h
3. preparation of and attendance in examination: 30 h

A total of 90 h = 3 CR

Recommendation

Basic knowledge in the field of physics and signal processing is helpful.

M**10.42 Module: Medical Imaging Technology II [M-ETIT-106670]**

Responsible: Prof. Dr. Maria Francesca Spadea
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Master's Transfer Account (Usage from 4/1/2024)

Credits 3	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language English	Level 4	Version 1
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Mandatory	
T-ETIT-113421	Medical Imaging Technology II

Competence Certificate

The examination takes place in form of a written examination lasting 60 minutes.

Prerequisites

none

Competence Goal

For each imaging modality students will be able to:

- identify required energy source;
- analyze the interactions between the form of energy and biological tissue
- distinguishing desired signal from noise contribution;
- critically interpret the image content to derive knowledge
- evaluate image quality and implementing strategies to improve it.

Moreover, the student will be able to communicate in technical and clinical English language.

Content

- the basic knowledge of mathematical and physical principles of medical imaging formation, including nuclear medicine imaging and magnetic resonance imaging.
- the component of medical imaging devices.
- assessment of image quality in terms of signal-to-noise-ratio, presence of artifact, spatial, spectral and temporal resolution
- safety and protection for patients and workers.

Module grade calculation

The module grade is the grade of the written exam.

Workload

- attendance in class: $15 \times 2h = 30h$
- preparation / follow-up: $15 \times 2h = 30h$
- exam preparation / attendance: $30h = 90h$

A total of 90h = 3 CR

Recommendation

- Basic knowledge in the field of physics and signal processing is helpful.
- The contents of the module "Medical Imaging Technology I" are recommended.

M**10.43 Module: Methods for Automation, Control Engineering and Robotics [M-ETIT-106373]**

Responsible: Prof. Dr.-Ing. Mike Barth
Prof. Dr.-Ing. Sören Hohmann

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

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

Mandatory		
T-ETIT-112903	Methods for Automation, Control Engineering and Robotics	6 CR Hohmann

Competence Certificate

The performance review takes the form of a written examination lasting 120 minutes.

Prerequisites

none

Competence Goal

Control Engineering (Prof. Hohmann) - Students:

- Can formally describe and analyze advanced system dynamics problems.
- can apply advanced methods of control design.
- can design multi-loop control loops.
- Can describe multivariable systems in the frequency domain and design simple decoupling control systems.
- know the principles of adaptive methods.
- can design simple switching control structures.
- can design digital control loops.

Robotics (Prof. Hohmann and Prof. Barth): The students:

- can derive kinematic and dynamic modeling of robotic systems.
- can derive the design of position and force based controllers.
- know principles of path and trajectory planning.
- Know advanced principles of human-machine collaboration.
- can perform risk, safety and hazard analysis in robotics.
- can digitally plan a robotic workstation and are able to use VR and AR technologies.

AT (Prof. Barth) - Students:

- Know advanced model-based methods of engineering automation systems.
- are able to plan decentralized and centralized AT systems
- know advanced architectures of AT systems.
- know IT/OT security aspects of AT based on IEC 62443.

know simulation-based methods of AT using the example of co-simulation.

Content

Lectures will be enhanced by lab streams, demonstrations, hands-on lab experiments, and blended learning.

- Topics covered will be:
 - Extended Nyquist criterion.
 - Hurwitz and Roth criterion
 - Digital control loops, deadbeat design
 - Loop Shaping
 - Meshed structures
 - Two degrees of freedom control
 - V, P structure
 - Anti-Windup, Scheduling Controller, Detachment Control
 - IMC, Smith predictor
- Direct kinematics, coordinate systems, rotation matrices
- Inverse kinematics
- Dynamics, Lagrangian description
- Path and trajectory planning, trajectory planning
- Axis control
- Co-simulation and Functional Mockup Units
- AT architectures (decentralized, centralized)
- IT/OT security analyses according to IEC 62443
- Basics of human-machine collaboration using the example of cobots (cooperation, collaboration, coexistence)
- Basics of information models using the example of AutomationML and the I4.0 reference architecture model
- Introduction to Robot Operating System 2.0
- AT communication technologies: cyclic vs. event-based; OPC UA, MQTT, industrial bus systems

Module grade calculation

The module grade is the grade of the written examination.

Workload

1. Attendance time in lectures: $15 \times 5 \text{ h} = 75 \text{ h}$
2. Preparation and follow-up of the same: $20 \times 5 \text{ h} = 80 \text{ h}$
3. Exam preparation and presence in the same: 25 h

Total: 180 LP = 6 LP

Recommendation

- Knowledge of basics from the basic studies in measurement and control technology, signals and systems as well as digital technology and automation technology is very helpful.
- The contents of the module Mathematics 1-3 are required.

M**10.44 Module: Microenergy Technologies [M-MACH-102714]**

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

Part of: [Master's Transfer Account](#)

Credits 4	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language English	Level 4	Version 2
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Mandatory	
T-MACH-105557	Microenergy Technologies

Competence Certificate

Oral exam: 45 min

Prerequisites

none

Competence Goal

The students can:

- describe the energy conversion principles and exemplify them
- explain the underlying concepts of thermodynamics and materials science
- illustrate the layout, fabrication and function of the treated devices
- calculate important properties (time constants, power output, efficiency, etc.)
- develop a layout based on specifications

Content

- Basic physical principles of energy conversion optimization

- Layout and design

Technologies
devices

- Selected

- Applications

The lecture includes amongst others the following topics:

- Micro energy harvesting of vibrations using different conversion principles (piezo, electrostatic, electromagnetic, etc.)
- Thermoelectric energy generation
- Novel thermal energy conversion principles (thermomagnetic, pyroelectric)
- Miniature scale solar devices
- RF energy harvesting
- Miniature scale heat pumping
- Solid-state cooling technologies (magneto-, electro-, mechanocalorics)
- Power management
- Energy storage technologies (microbatteries, supercapacitors, fuel cells)

Module grade calculation

Module grade calculation

The module grade is the grade of the written exam.

Workload

Time of attendance: $15 * 1,5 \text{ h} = 22,5 \text{ h}$

Preparation and follow up: $15 * 5,5 \text{ h} = 82,5 \text{ h}$

Exam Preparation and Exam: 15 h

Total: $120 \text{ h} = 4 \text{ LP}$

Literature

- Lecture notes (overhead transparencies) „Micro Energy Technologies“
- Stephen Beeby, Neil White, Energy Harvesting for Autonomous Systems, Artech House, 2010
- Shashank Priya, Daniel J. Inman, Energy Harvesting Technologies, Springer, 2009

M**10.45 Module: Mobile Computing and Internet of Things (IN3INMC) [M-INFO-101249]**

Responsible: Prof. Dr.-Ing. Michael Beigl

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 5	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 2
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Mandatory			
T-INFO-102061	Mobile Computing and Internet of Things	2,5 CR	Beigl
T-INFO-113119	Mobile Computing and Internet of Things - Exercise	2,5 CR	Beigl

Prerequisites

None

M**10.46 Module: Modelling and Simulation [M-MACH-100296]**

Responsible: Prof. Dr. Britta Nestler

Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

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

T-MACH-100300	Modelling and Simulation	5 CR	Gumbsch, Nestler
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Competence Certificate

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

Competence Goal

The student can

- explain the basic algorithms and numerical methods which are beside other applications relevant for materials simulations.
- describe and apply numerical solution methods for partial differential equations and dynamical systems
- apply numerical methods to solve heat and mass diffusion problems which can also be used to model microstructure formation processes
- has experiences in how to implement and program the introduced numerical methods from an integrated computer lab.

Content

The course gives an introduction to modelling and simulation techniques.

The following topics are included:

- splines, interpolation methods, Taylor series
- finite difference method
- dynamical systems
- numerics of partial differential equations
- mass and heat diffusion
- microstructure simulation
- parallel and adaptive algorithms
- high performance computing
- practical exercises

M**10.47 Module: Optics and Solid State Electronics [M-ETIT-105005]****Responsible:** Prof. Dr. Ulrich Lemmer**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)**Credits**
6**Grading scale**
Grade to a tenth**Recurrence**
Each summer term**Duration**
1 term**Language**
German**Level**
2**Version**
1**Mandatory**

T-ETIT-110275	Optics and Solid State Electronics	6 CR	Lemmer
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M**10.48 Module: Optoelectronic Components [M-ETIT-100509]**

Responsible: Prof. Dr. Wolfgang Freude

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 4	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language English	Level 2	Version 1
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Mandatory	
T-ETIT-101907	Optoelectronic Components

Competence Certificate

Type of Examination: oral exam

Duration of Examination: approx. 30 minutes

Modality of Exam: Oral examination, usually one examination day per month during the Summer and Winter terms. An extra questions-and-answers session will be held if students wish so.

Prerequisites

none

Competence Goal

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

The students

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

Content

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

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

Module grade calculation

The module grade is the grade of the oral exam.

Annotation

There are no prerequisites, but solution of the problems on the exercise sheet, which can be downloaded as homework each week, is highly recommended. Also, active participation in the problem classes and studying in learning groups are strongly advised.

Workload

total 120 h, hereof 45 h contact hours (30 h lecture, 15 h problem class), and 75 h homework and self-studies

Recommendation

Minimal background required: Calculus, differential equations, Fourier transforms and p-n junction physics.

Literature

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

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

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

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

M**10.49 Module: Orientation Exam [M-MACH-106549]****Organisation:** University**Part of:** Orientation Exam

Credits 0	Grading scale pass/fail	Recurrence Each term	Duration 2 terms	Language German	Level 1	Version 1
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Mandatory						
T-MACH-112904	Engineering Mechanics I		6 CR	Böhlke, Langhoff		
T-ETIT-113001	Linear Electronic Networks		6 CR	Jelonnek, Kempf		
T-ETIT-109317	Linear Electronic Networks - Workshop A		1 CR	Leibfried, Lemmer		
T-ETIT-109811	Linear Electronic Networks - Workshop B		1 CR	Nahm		

Modelled deadlineThis module must be passed until the end of the **3. term**.**Prerequisites**

None

M**10.50 Module: Photovoltaic System Design [M-ETIT-100411]****Responsible:** Dipl.-Ing. Robin Grab**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

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

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

none

M**10.51 Module: Physiology and Anatomy for Engineers I [M-ETIT-100390]**

Responsible: Prof. Dr. Werner Nahm

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 3	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 3
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Mandatory						
T-ETIT-101932	Physiology and Anatomy for Engineers I			3 CR	Nahm	

Competence Certificate

Success control is carried out in the form of a written test of 60 minutes.

Prerequisites

The module "M-ETIT-105874 – Physiologie und Anatomie für die Medizintechnik" must not been started.

Content

The lecture provides basic knowledge about the essential organ systems of humans and medical terminology. It is aimed at students of technical courses who are interested in physiological issues.

Thematic blocks:

- Organizational levels of the organism
- Building blocks of life
 - Proteins
 - Lipids
 - Carbohydrates
 - Lipids
 - Nucleic acids
- Cells
 - Structure
 - Membrane transport processes
 - Protein biosynthesis
 - Cell respiration
 - Nerve cells
 - Muscle cells
- Tissue
 - Tissue types
 - Cell connections
- Sensory organs
 - Eye
 - Hearing

Module grade calculation

The module grade is the grade of the written exam.

Workload

Each credit point corresponds to approximately 25-30 hours of work (of the student). This is based on the average student who achieves an average performance. The workload includes:

- Attendance time in lectures (2 h, 15 appointments each) = 30 h
- Self-study (3 h, 15 appointments each) = 45 h
- Preparation / post-processing = 15 h

Total effort approx. 90 hours = 3 LP

M**10.52 Module: Power Generation [M-ETIT-100407]**

Responsible: Dr.-Ing. Bernd Hoferer

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 3	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory	
T-ETIT-101924	Power Generation

Competence Certificate

Success is assessed in an overall oral examination (approx. 20 minutes) on the selected course.

Competence Goal

Students are able to recognize energy technology problems and develop solutions. They have gained an understanding of the physical and theoretical relationships in energy technology. They are also able to describe, analyze and explain the developed solutions in a scientific format.

Content

Basic lecture on the generation of electrical energy. From the conversion of the earth's primary energy resources in coal-fired power plants and in nuclear power plants to the use of renewable energies, the lecture covers the entire spectrum of generation. The lecture provides an overview of the physical principles, the technical and economic aspects and the development potential of generating electrical energy from both conventional and renewable sources.

Module grade calculation

The module grade is the grade of the oral examination.

Workload

Attendance time: 30 h

Self-study time: 60 h

Total 90 h = 3 LP

M**10.53 Module: Product Lifecycle Management [M-MACH-106195]**

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

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 4	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 2
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Mandatory	
T-MACH-105147	Product Lifecycle Management

Competence Certificate

Written examination 90 min.

Prerequisites

None

Competence Goal

After successful attendance of the course, students can:

- identify the challenges of data management and exchange and describe solution concepts for these challenges.
- clarify the management concept PLM and its goals and highlight the economic benefits.
- explain the processes required to support the product life cycle and describe the most important business software systems (PDM, ERP, ...) and their functions.

Content

- Basics for product data management and data exchange
- IT system solutions for Product Lifecycle Management (PLM)
- Economic viability analysis and implementation problems
- Illustrative scenario for PLM using the example of the institute's own I4.0Lab

Module grade calculation

The module grade is the grade of the written exam

Workload

Attendance time in lectures and exercises: $15 \times 3 \text{ h} = 45 \text{ h}$

Preparation and follow-up of the same: $15 \times 2 \text{ h} = 30 \text{ h}$

Exam preparation and presence in the same: 45 h

Total: 120 h = 4 LP

Learning type

Lectures and exercises

M**10.54 Module: Production Technology [M-MACH-106671]**

Responsible: Prof. Dr.-Ing. Volker Schulze

Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 2: Mechanical Engineering)

Credits 12	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory				
T-MACH-112974	Additive Manufacturing: Development and Manufacturing of Metallic Components		4 CR	Schulze, Zanger
T-MACH-112971	Basics of Production Automation		4 CR	Fleischer
T-MACH-112972	Smart Factory		4 CR	Lanza

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

Learning type

lectures/tutorials, depending on the choice of courses

Literature

see individual courses

M**10.55 Module: Programming (IN1INPROG) [M-INFO-101174]**

Responsible: Prof. Dr.-Ing. Anne Kozolek
Prof. Dr. Ralf Reussner

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 5	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory						
T-INFO-101967	Programming Pass			0 CR	Kozolek, Reussner	
T-INFO-101531	Programming			5 CR	Kozolek, Reussner	

Competence Goal

Students should learn

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

Content

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

M**10.56 Module: Radiation Protection [M-ETIT-100562]**

Responsible: PD Dr. Bastian Breustedt
Prof. Dr. Werner Nahm

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 3	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language English	Level 2	Version 1
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Mandatory	
T-ETIT-100825	Radiation Protection

Competence Certificate

Success control is carried out as part of an overall written examination (2 h).

Prerequisites

none

Competence Goal

- The students understand the terminology used in radiation protection and apply it correctly.
- The students are able to describe the types of ionizing radiation, their properties and the principles for their measurement.
- The students are able to describe the biological risks associated to exposures to ionizing radiation.
- The students are able to describe the basic principles of radiation protection and their implementation in national and international law.
- Based on a basic understanding of the scientific foundations of radiation protection the students are able to critically evaluate radiation protection measures for a given situation, which involves the use of ionizing radiation.

Content

The module covers the basics of radiation protection for ionizing radiation and provides an overview of the subject.

The topics which will be covered are:

- Ionizing Radiation and its applications,
- Interaction of Radiation with Matter,
- Biological Effects of Radiation,
- Measurement of Radiation – Principles and detector designs,
- Measurement of Radiation – Applications and Examples
- Dosimetry for external + internal Exposures,
- Legal Aspects (Regulation, Ethics) and
- Radiation Protection – Principles and Application

The students will gain insight on ionizing radiation, its applications and the biological risks associated with exposures to ionizing radiation. The scientific foundations of radiation protection (natural sciences, engineering, medicine as well as sociological and legal basics) are summarized. The principles, standards and practice of radiation protection in applications of ionizing radiation are derived and demonstrated.

Module grade calculation

The module grade is the grade of the written exam.

Workload

Each credit point corresponds to approximately 25-30 hours of work (of the student). This is based on the average student who achieves an average performance. The workload includes:

Attendance time in lectures (2 h * 15 appointments each) = 30 h

Self-study (3 h * 15 appointments each) = 45 h

Preparation / post-processing = 20 h

Total effort approx. 95 hours = 3 LP

Recommendation

Basic knowledge in the field of physics is helpful.

M**10.57 Module: Radio-Frequency Electronics [M-ETIT-105124]**

Responsible: Prof. Dr.-Ing. Ahmet Cagri Ulusoy
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 5	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language English	Level 2	Version 2
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Mandatory						
T-ETIT-110359	Radio-Frequency Electronics			5 CR	Ulusoy	

Competence Certificate

The success criteria will be determined by a written examination of 120 min.

Prerequisites

none

Competence Goal

- * The students have a comprehensive understanding of the theory and the basic design methodology of electronic circuits at high frequencies.
- * They understand the limitations of active and passive circuit elements including various transistor technologies and their impact on the applications.
- * They understand the limitations and how linear network theory is applied for advanced electronic circuits.
- * The students can apply the acquired theoretical knowledge using modern design tools.

Content

In this module, the theory and design methodology of high-frequency electronic circuits will be studied in detail. The focus of the module is on the fundamentals of active linear circuits. The important topics are phasor analysis, resonance, impedance matching networks, two-port parameters of transistors, high-frequency behavior of basic amplifier circuits, practical design methodology of high-frequency amplifiers, and introduction to the design of non-linear circuits using the linear design methodology. In the tutorial the student will have the possibility to apply their theoretical knowledge by designing, assembling and testing a radio-frequency amplifier in the framework of a design challenge.

Module grade calculation

The module grade is the grade of the written examination.

Workload

1. Attendance to the lectures ($15*(2)=30h$)
2. Attendance to the exercises and workshop ($15*(2)=30h$)
3. Preparation to the lectures, exercises and workshop ($15*(1+1)=30h$)
4. Preparation of homework assignments and to the oral exam ($20+40h$)

Total: $150h = 5L$

Recommendation

Contents of the modules "Linear electrical networks" and "Electronic circuits".

M**10.58 Module: Robotics I - Introduction to Robotics [M-INFO-100893]**

Responsible: Prof. Dr.-Ing. Tamim Asfour

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 6	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German/English	Level 2	Version 3
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Mandatory						
T-INFO-108014	Robotics I - Introduction to Robotics		6 CR	Asfour		

Competence Certificate

See partial achievements (Teilleistung)

Prerequisites

See partial achievements (Teilleistung)

Competence Goal

The student is able to apply the presented concepts to simple and realistic tasks from robotics. This includes mastering and deriving the mathematical concepts relevant for robot modeling. Furthermore, the student masters the kinematic and dynamic modeling of robot systems, as well as the modeling and design of simple controllers. The student knows the algorithmic basics of motion and grasp planning and can apply these algorithms to problems in robotics. He/she knows algorithms from the field of image processing and is able to apply them to problems in robotics. He/she is able to model and solve tasks as a symbolic planning problem. The student has knowledge about intuitive programming procedures for robots and knows procedures for programming and learning by demonstration.

Content

The lecture provides an overview of the fundamentals of robotics using the examples of industrial robots, service robots and autonomous humanoid robots. An insight into all relevant topics is given. This includes methods and algorithms for robot modeling, control and motion planning, image processing and robot programming. First, mathematical basics and methods for kinematic and dynamic robot modeling, trajectory planning and control as well as algorithms for collision-free motion planning and grasp planning are covered. Subsequently, basics of image processing, intuitive robot programming especially by human demonstration and symbolic planning are presented.

In the exercise, the theoretical contents of the lecture are further illustrated with examples. Students deepen their knowledge of the methods and algorithms by independently working on problems and discussing them in the exercise. In particular, students can gain practical programming experience with tools and software libraries commonly used in robotics.

Workload

Lecture with 3 SWS + 1 SWS Tutorial, 6 LP

6 LP corresponds to 180 hours, including

$15 * 3 = 45$ hours attendance time (lecture)

$15 * 1 = 15$ hours attendance time (tutorial)

$15 * 6 = 90$ hours self-study and exercise sheets

30 hours preparation for the exam

M**10.59 Module: Scientific Computing for Engineers [M-MACH-105369]****Responsible:** Dr. Daniel Weygand**Organisation:** KIT Department of Mechanical Engineering**Part of:** Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 4	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory	
T-MACH-100532	Scientific Computing for Engineers

Competence Certificate

written exam 90 minutes

Prerequisites

none

Competence Goal

The student can

- apply the programming language C++ for scientific computing in the field of materials science
- adapt programs for use on parallel platforms
- choose suitable numerical methods for the solution of differential equations.

Content

1. Introduction: why scientific computing
2. computer architectures
3. Introduction to Unix/Linux
4. Foundations of C++
- * programm organization
- * data types, operator, control structures
- * dynamic memory allocation
- * functions
- * class
- * OpenMP parallelization
5. numeric /algorithms
- * finite differences
- * MD simulations: 2nd order differential equations
- * algorithms for particle simulations
- * solver for linear systems of eqns.

Annotation

The lecture can not be combined with the lecture "Application of advanced programming languages in mechanical engineering" (2182735).

Workload

regular attendance: 22,5 hours

Lab: 22,5 hours (optional)

self-study: 75 hours

Learning type

Tutorial

Literature

1. C++: Einführung und professionelle Programmierung; U. Breymann, Hanser Verlag München
2. C++ and object-oriented numeric computing for Scientists and Engineers, Daoqui Yang, Springer Verlag.
3. The C++ Programming Language, Bjarne Stroustrup, Addison-Wesley
4. Die C++ Standardbibliothek, S. Kuhlins und M. Schader, Springer Verlag
5. Numerical recipes in C++ / C / Fortran (90), Cambridge University Press
6. Numerische Mathematik, H.R. Schwarz, Teubner Stuttgart
7. Numerische Simulation in der Moleküldynamik, Griebel, Knapek, Zumbusch, Caglar, Springer Verlag

M**10.60 Module: Seminar Battery [M-ETIT-103037]**

Responsible: Dr.-Ing. Andre Weber

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 3	Grading scale Grade to a tenth	Recurrence Each term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory	
T-ETIT-106051	Seminar Battery

Prerequisites

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

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

M**10.61 Module: Seminar Fuel Cell I [M-ETIT-105320]**

Responsible: Dr.-Ing. Andre Weber

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 3	Grading scale Grade to a tenth	Recurrence Each term	Duration 1 term	Language German/English	Level 2	Version 1
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Mandatory						
T-ETIT-110798	Seminar Fuel Cell I			3 CR	Weber	

Competence Certificate

The examination consists of a written paper and an oral presentation of the students work. The overall impression is rated.

Prerequisites

none

Competence Goal

After completing the seminar, the students are able to familiarize themselves independently with an engineering question in the field of fuel cells, analyze the associated literature and present it in the form of a written report and a presentation.

Content

The seminar "Fuel Cell Research Projects" is primarily aimed at students who are planning to carry out a scientific thesis in the fuel cell research area.

In this seminar the participants deal with scientific questions in the field of fuel cells. This includes a literature search, the compilation of the methods, processes and results described in the publications as well as a critical evaluation of the same.

The results are summarized in a seminar paper and presented in a lecture during the seminar. The written work and a lecture that has to be given during the event are included in the grading of the thesis.

Module grade calculation

The module grade results of the assessment of the written paper and the oral presentation. Details will be given during the lecture.

Workload

1. Presence seminar: $15 * 2 \text{ h} = 30 \text{ h}$
2. Preparation of seminar paper and lecture: 30 h
3. Preparation of seminar lecture: 30 h

Total: 90 h = 3 LP

M**10.62 Module: Seminar on Selected Chapters of Biomedical Engineering [M-ETIT-100383]**

Responsible: Dr.-Ing. Axel Loewe

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 3	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory	
T-ETIT-100710	Seminar on Selected Chapters of Biomedical Engineering

Competence Certificate

Success monitoring is carried out in the context of a lecture (approx. 25 minutes) followed by a discussion (approx. 10 minutes).

Prerequisites

none

Competence Goal

The students are able to research a scientific topic from biomedical technology, work out essentials, process the content, prepare a lecture and finally present it.

Content

The seminar aims to enable students to independently work on and present a scientific topic in the field of biomedical engineering in order to improve their presentation skills. First, an introduction to presentation techniques and feedback rules is given. Then there is a test presentation to try out the techniques learned. Finally, the students select a topic of biomedical engineering for their presentation and prepare a specialist lecture on this topic.

Workload

Attendance time: 15 weeks * 2SWS = 30h

Development of the topic, exchange with supervisor, preparation of the lecture: 60h

M**10.63 Module: Seminar Power Electronics in Regenerative Energy Systems [M-ETIT-100397]**

Responsible: Prof. Dr.-Ing. Marc Hiller

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

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 4	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory		
T-ETIT-100714	Seminar Power Electronics in Regenerative Energy Systems	4 CR Hiller

Prerequisites

none

M**10.64 Module: Seminar: Fundamentals of Embedded Systems [M-ETIT-105356]**

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

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 1: Electrical Engineering and Information Technology)
 Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

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

Mandatory						
T-ETIT-110832	Seminar: Fundamentals of Embedded Systems			4 CR	Becker, Sax, Stork	

Competence Certificate

Success is assessed in the form of a written paper, reviews and a presentation. The overall impression is assessed.

Prerequisites

none

Competence Goal

Seminar participants can independently familiarize themselves with a given technical topic, identify all relevant aspects and summarize the results. Within this framework, students can identify relevant literature in terms of the research question, assess the strengths and weaknesses of existing approaches and methods, and formally evaluate other works according to predefined criteria. They can present the results of their work concisely in the form of a short text (approx. 6-page paper, usually written in English) and an approx. 15-minute presentation in words and pictures (slides).

Content

In the "Fundamentals of Embedded Systems" seminar, students work on a given topic from the field of information processing through literature and internet research under the guidance of research assistants and then present it to the other seminar participants in a short text (approx. 6-page paper, usually written in English) and an approx. 15-minute presentation in words and pictures (slides). The students give each other feedback as part of a peer review and thus experience a part of the scientific publication process.

Module grade calculation

The grading is based on the elaboration, the mutual review and the presentation.

Workload

The workload includes:

1. Independent familiarization with a topic: 50h
2. Writing a scientific article: 40h
3. Preparing a peer review: 10h
4. Preparing and giving a presentation: 20h

Total: 120h = 4 LP

M**10.65 Module: Signals and Systems [M-ETIT-106372]**

Responsible: Dr.-Ing. Mathias Kluwe
Prof. Dr.-Ing. Sander Wahls

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [Engineering Fundamentals](#)

Credits 8	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 2 terms	Language German	Level 2	Version 2
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Mandatory			
T-ETIT-112860	Signals and Systems	7 CR	Kluwe, Wahls
T-ETIT-112861	Signals and Systems - Workshop	1 CR	Kluwe, Wahls

Competence Certificate

The assessment of success takes place in the form of a written examination lasting 120 minutes. In addition, the completion of the written work in the workshop is a prerequisite for passing the module.

Prerequisites

none

Competence Goal

The students master the basics, properties and calculation rules of the Laplace transformation and can apply these to solve linear differential equations.

- The students are able to use the Laplace transformation to describe time-continuous dynamic systems.
- The students know some basics of complex analysis in the context of integral transformations such as Laurent expansion and theorem of residuals.
- The students know the complex inverse formula of the La-place transformation and can use it for complicated image functions.
- The students know the two-sided Laplace transformation and master the basics, properties and calculation rules of the Fourier transformation.
- Students can use the Fourier transformation to describe time-continuous signals in the frequency domain.
- Students are familiar with the sampling theorem for converting time-continuous into time-discrete signals and can use the discrete Fourier transform to describe time-discrete signals in the frequency domain.
- The students are familiar with the basics, properties and calculation rules of the z-transformation.
- Students can use the z-transformation to describe time-discrete systems.

Content

- Laplace transform
 - Motivation and Definition
 - Properties and Examples
- Laplace transform of ordinary differential equations
 - Ordinary and generalized differentiation rule
 - Laplace transform of general linear differential equations with constant coefficients
 - Back transformation via the partial fraction decomposition of rational functions
 - Calculation rules of the Laplace transform (1):
Integration rule and damping rule
 - Back transformation over the convolution rule of the Laplace transformation
 - Calculation rules of the Laplace transform (2):
Displacement rules and limit theorems
- Characterization of the transfer behavior of dynamic systems with transfer and weight function
- Function theory: Laurent expansion, residual and residual theorem
- Complex inversion formula of the Laplace transformation
 - Derivation of the complex inverse formula
 - Calculation of the complex inverse integral
- Two-sided Laplace Transform and Fourier Transform
 - Two-sided Laplace Transform
 - Definition and properties of the Fourier transform
 - Calculation rules and correspondences of the Fourier transform
- z-Transform
 - Definition, properties and calculation rules of the z-transform
 - Use for the solution of difference equations
- Mathematical basics: Spaces
- Time-continuous signals
 - Fourier series
 - Fourier transform
 - Test signals
 - General signal properties
- Continuous-time systems
 - Properties
 - System description by differential equations
 - Laplace transform
 - System function
 - Frequency selective filters
- Discrete-Time Signals
 - Fourier transform of discrete-time signals
 - Sampling theorem
 - Discrete Fourier Transform
- Discrete-Time Systems
 - Properties
 - System description by difference equations
 - The z-transformation
 - System function
 - Discrete-time representation of continuous systems
 - Frequency selective filters

Module grade calculation

The module grade is the grade of the written exam.

Workload

Total approx. 240h, of which

Attendance time in lectures and exercises: 75h

Preparation/follow-up of the lectures and exercises: 115h

3. Exam preparation and presence in the same: 25h

Preparation time for the workshop: 5h

Presence time in the workshop: 15h

Preparation of the protocol for the workshop: 5h

Total: 240 LP = 8 LP

Recommendation

Knowledge of HM3 is helpful.

M**10.66 Module: Software Engineering I (IN1INSWT1) [M-INFO-101175]**

Responsible: Prof. Dr.-Ing. Ina Schaefer

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 6	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory						
T-INFO-101968	Software Engineering I			6 CR	Schaefer	
T-INFO-101995	Software Engineering I Pass			0 CR	Schaefer	

Competence Goal

The students acquire basic knowledge about the principles, methods and tools of software engineering. They learn how to build and to maintain complex software systems in a systematic way.

Content

The content of the lecture is the entire lifecycle of software, spanning project planning, system analysis, cost estimation, design, implementation, validation, verification, and finally the maintaining of software. The covered topics include UML, design patterns, software tools, programming environments and configuration control/versioning systems.

Workload

approx. 180 h

M**10.67 Module: Software Engineering II (IN4IN SWT2) [M-INFO-100833]**

Responsible: Prof. Dr.-Ing. Anne Kozolek
Prof. Dr. Ralf Reussner

Organisation: KIT Department of Informatics

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

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

Mandatory	
T-INFO-101370	Software Engineering II

Content

Requirements engineering, software development processes, software quality, software architectures, MDD, Enterprise Software Patterns software maintainability, software security, dependability, embedded software, middleware, domain-driven design

M**10.68 Module: Superconducting Magnet Technology [M-ETIT-106684]****Responsible:** Prof. Dr. Tabea Arndt**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management) (Usage from 4/1/2024)

Credits 4	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language English	Level 2	Version 1
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Mandatory	
T-ETIT-113440	Superconducting Magnet Technology

Competence Certificate

The examination takes place in form of an oral exam (abt. 30 minutes).

Two timeslots (weeks) for examination dates will be announced (usually near end of lecture period & end of semester)

Prerequisites

none

Competence Goal

- The students have a solid knowledge of architecture and design aspects of applications in magnets, windings and coils in power engineering.
- For the most important magnet applications the students can apply the state of the art, choose between options and can reflect the main benefits.
- The students have a clear understanding of opportunities, benefits and limitations of superconducting windings and magnets.
- The students are able to perform the required design calculations and to solve fundamental design questions independently.

Content

As the materials become increasingly mature and powerful, using superconductivity in a variety of applications of electrical engineering is of rising interest and benefit, too. This module focuses on Superconducting Magnet Technology:

Windings, coils and magnets may be used as a device by itself (providing high magnetic fields e.g. in MRI, NMR, accelerators, industry magnets, etc.) or as components for Power Systems.

This section will cover the following aspects:

- Unique selling points of superconducting windings.
- Basic approaches and tools to design superconducting windings.
- Discussion of winding architectures
- Criteria to design the appropriate operating temperatures, materials, conductors, cooling technology for the electromagnetic purpose.
- Limits and opportunities when preparing and operating superconducting windings.
- Measures for safe operation of superconducting magnets.
- High-Field Magnets
- Magnets for Fusion Technology
- 3D topologies (e.g. in dipole magnets or motors/ generators)
- New options potentially offered by widespread use of hydrogen.
- New winding topologies

In the exercises, selected magnets will be designed and calculated analytically and with some computational tools (e.g. dipole magnets and compact, cryogen free HTS-magnets)

The lecturer may change the details of the content without further notice. Materials will be offered on ILIAS.

Module grade calculation

The module grade is the grade of the oral exam.

Workload

1. attendance in lectures and exercises: $15 \times 3 \text{ h} = 45 \text{ h}$
2. preparation / follow-up: $15 \times 3 \text{ h} = 45 \text{ h}$
3. preparation of and attendance in examination: 30 h

A total of 120 h = 4 CR

Recommendation

Having knowledge in "Superconducting Materials" is beneficial, but not mandatory.

M**10.69 Module: Superconducting Power Systems [M-ETIT-106683]**

Responsible: Prof. Dr. Mathias Noe
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management) (Usage from 4/1/2024)

Credits 4	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language English	Level 2	Version 1
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Mandatory	
T-ETIT-113439	Superconducting Power Systems

Competence Certificate

The examination takes place in form of an oral exam (abt. 45 minutes).

Prerequisites

none

Competence Goal

- The students have a solid knowledge of architecture and design aspects of applications in windings and energy technology devices.
- For the most important power system applications the students can apply the state of the art and can reflect the main benefits.
- The students have a clear understanding of opportunities, benefits and limitations of superconducting components and devices.
- The students are able to perform the required design calculations and to solve fundamental design questions independently.

Content

As the materials become increasingly mature and powerful, using superconductivity in a variety of applications of electrical engineering is of rising interest and benefit, too. This module focuses on Superconducting Power Systems.

It will provide an overview of the state of the art, will give an insight into the basic setup, the design, the characteristic parameters and the specific operation behaviour of the following applications:

- Power Transmission Cables and Lines
- Motors and Generators
- Transformers
- Fault Current Limiters
- Magnetic Energy Storage
- Basics of Cryo Technology

For each application a design example is shown and the focus is given on the conceptual design of each application.

The lecturers may change the details of the content without further announcement.

Materials will be offered on ILIAS.

Module grade calculation

The module grade is the grade of the oral exam.

Workload

1. attendance in lectures and exercises: $15 \times 3 \text{ h} = 45 \text{ h}$
2. preparation / follow-up: $15 \times 3 \text{ h} = 45 \text{ h}$
3. preparation of and attendance in examination: 30 h

A total of 120 h = 4 CR

Recommendation

Having knowledge in „Superconducting Materials“ is beneficial.
Successful participation in „Superconductivity for Engineers“

M**10.70 Module: Superconductors for Energy Applications [M-ETIT-105299]**

Responsible: apl. Prof. Dr. Francesco Grilli

Organisation: KIT Department of Chemical and Process Engineering
KIT Department of Electrical Engineering and Information Technology

KIT Department of Mechanical Engineering

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 5	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language English	Level 2	Version 1
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Mandatory	
T-ETIT-110788	Superconductors for Energy Applications

Competence Certificate

oral exam approx. 30 minutes.

Prerequisites

The module "Superconducting Materials for Energy Applications" must not be taken.

Competence Goal

The students acquire a good knowledge of physical properties of superconductors including those currently employed in energy applications (niobium-based superconductors, cuprates, MgB₂) and also promising recently discovered ones (pnictides)).

The students have a thorough understanding of the wide range of superconducting energy applications (magnets, cables, fault current limiters, motors, transformers, etc.). They can discuss the advantages they offer with respect to their conventional counterparts; they can also define the scientific and technical challenges involved in those applications.

With the practical exercise, the students learn to use different software packages (Matlab, Comsol Multiphysics) and to model the electromagnetic and thermal behavior of superconducting wires and applications.

The students are able to talk about topic-related aspects in English using the technical terminology of the field of study.

Content

Superconductivity is one of the most important discoveries in physics in the twentieth century and has just celebrated its 100th birthday. Investigating the origins of the universe in particle accelerators or having detailed images of the human body with MRI would be impossible without employing technology based on superconductors. The near future will see superconductors enter our everyday life even more deeply, in the form of cables powering our cities, fault current limiters protecting our electric grids, and super-fast levitating trains reducing dramatically travel times.

The lecture provides an introduction to superconductivity with an overview of its main features and of the theories developed to explain it. Superconducting materials and their properties will be presented, especially materials currently employed in energy applications (niobium-based superconductors, uprates, MgB₂) and promising recently discovered ones (pnictides). The wide range of superconducting energy applications (magnets, cables, fault current limiters, motors, transformers, etc.) will be covered as well as the advantages they offer with respect to their conventional counterparts.

The practical exercises are based on using numerical models (e.g. finite-element method or network approach) to investigate the electromagnetic and thermal behavior of superconducting wires and applications such as cables and magnets.

Module grade calculation

The module grade is the grade of the oral exam.

Workload

Each credit point (LP) corresponds to approximately 30 hours of work (by the student). This is based on the average student who achieves an average performance.

The workload in hours is broken down as follows:

1. Presence time in lectures, exercises 45 h
2. Preparation / Post-processing of the same 30 h
3. Exam preparation and presence in the same 75 h

Recommendation

A basic knowledge of electromagnetism and thermodynamics is the only requirement. Previous knowledge of superconductivity is not necessary.

M**10.71 Module: Supplementary Studies on Culture and Society [M-ZAK-106235]**

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: Additional Examinations

Credits 22	Grading scale Grade to a tenth	Recurrence Each term	Duration 3 terms	Language German	Level 3	Version 1
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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 examination 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**10.72 Module: Supplementary Studies on Sustainable Development [M-ZAK-106099]**

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: Additional Examinations

Credits 19	Grading scale Grade to a tenth	Recurrence Each term	Duration 3 terms	Language German	Level 3	Version 1
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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 examination 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**10.73 Module: Systematic Materials Selection [M-MACH-106054]**

Responsible: Dr.-Ing. Stefan Dietrich

Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 4	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 2	Version 2
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Mandatory

T-MACH-100531	Systematic Materials Selection	4 CR	Dietrich, Schulze
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Competence Certificate

The assessment is carried out as a written exam of 2 h.

Prerequisites

none

Competence Goal

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.

Content

Important aspects and criteria of materials selection are examined and guidelines for a systematic approach to materials selection are developed. The following topics are covered:

- Information and introduction
- Necessary basics of materials
- Selected methods / approaches of the material selection
- Examples for material indices and materials property charts
- Trade-off and shape factors
- Sandwich materials and composite materials
- High temperature alloys
- Materials for Medical Devices, Healthcare Products and Bionics
- Regard of process influences
- Sustainability in Material Selection
- Incorrect material selection and the resulting consequences
- Abstract and possibility to ask questions

Module grade calculation

Module grade is equivalent to the grade of the exam.

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).

Recommendation

Basic knowledge in materials science, mechanics and mechanical design due to the lecture Materials Science I/II.

Learning type

Lecture

M**10.74 Module: Systems Engineering and AI-Methods [M-ETIT-106474]**

Responsible: Prof. Dr.-Ing. Eric Sax

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 1: Electrical Engineering and Information Technology)

Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 6	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory	
T-ETIT-113087	Introduction to Systems Engineering and AI-Methods
T-ETIT-113146	Laboratory Systems Engineering and AI-Methods

Prerequisites

none

M**10.75 Module: Systems Modeling [M-ETIT-106415]****Responsible:** Prof. Dr.-Ing. Mike Barth**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [Engineering Fundamentals](#)

Credits 2	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 1
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Mandatory	
T-ETIT-112989	Systems Modeling

Competence Certificate

Success is checked in the form of a written exam lasting 60 minutes.

Prerequisites

none

Competence Goal

The students:

- can apply the automaton design learned in Digital Technology in depth and transfer it to other event-discrete systems.
- know Petri nets and their design and switching logic with regard to automation-technical systems.
- can structure technical systems into different layers and hierarchies and know well-known system models.
- know basic mechatronic systems and their principles for exchanging information.
- can distinguish networked system architectures and assign technical terms of information technology.
- understand the depiction of systems in modeling hierarchies as well as their respective abstraction and goals
- understand the differences in modeling systems with distributed and with lumped parameters.
- know computer-based tools for modeling and simulating systems with concentrated parameters.

Content**Lecture (7 lecture units starting in early January)**

- Systems modeling with spatially concentrated parameters.
- In-depth automata theory with a focus on automated systems.
- Petri nets in extension of the parallelizing possibilities of automata.
- Formal analysis of Petri nets regarding reachability.
- Basics for modeling simple continuous systems.
- System models and hierarchies of mechatronics and automation technology.
- Basic system concepts of mechatronic systems related to system architectures (OSI, cloud, edge, centralized, decentralized, orchestration, choreography, service architectures, virtualization).
- Description of systems with the help of signals (effects) between subsystems, block diagram.

Exercise

Accompanying the lecture, the basics of systems modeling with spatially concentrated parameters are deepened in the exercise. For this purpose, exercises are modeled and calculated together and the solution methods are discussed.

Module grade calculation

The module grade is the grade of the written exam.

Annotation**This module starts at the beginning of January.**

It is recommended to be taken by BSc MIT students in their 1st or 3rd semester.

WorkloadAttendance time in 7 lectures and 3 exercises two: $10 * 1.5 \text{ h} = 45 \text{ h}$

2. Preparation/follow-up of the same: 30 hours (approx. 2 hours per unit)

3. Exam preparation and presence in the same: = 10h + 1h

Total: 56 h = 2 CP

M**10.76 Module: Technical Thermodynamics and Heat Transfer I [M-MACH-102386]**

Responsible: Prof. Dr. Ulrich Maas

Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits
8

Grading scale
Grade to a tenth

Recurrence
Each winter term

Duration
1 term

Language
German/English

Level
2

Version
5

Mandatory			
T-MACH-104747	Technical Thermodynamics and Heat Transfer I	8 CR	Maas
T-MACH-105204	Excercises in Technical Thermodynamics and Heat Transfer I <i>This item will not influence the grade calculation of this parent.</i>	0 CR	Maas

Competence Certificate

See individual courses

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.

Content

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

Module grade calculation

Grade of the written exam

Annotation

This module, including all brick details, exams and courses, is offered in German language.

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

Workload

Lectures and exercises: 75 h

Homework and preparation of examination: 165 h

Learning type

Lecture

Exercise course

Tutorial

Literature

Script

Additional literature will be provided in the lecture.

M**10.77 Module: Technical Thermodynamics and Heat Transfer II (7) [M-MACH-102830]**

Responsible: Prof. Dr. Ulrich Maas

Organisation: KIT Department of Mechanical Engineering

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 7	Grading scale Grade to a tenth	Recurrence Each summer term	Duration 1 term	Language German/English	Level 2	Version 2
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Mandatory			
T-MACH-105287	Technical Thermodynamics and Heat Transfer II	7 CR	Maas
T-MACH-105288	Excercises in Technical Thermodynamics and Heat Transfer II	0 CR	Maas

Competence Certificate

See individual courses

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 transfer mechanisms.

Content

- Repetition of the topics of "Thermodynamics and Heat Transfer I"
- Behavior of mixtures
- Moist air
- 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 transfer

Module grade calculation

Weighting according to credit points.

Annotation

This module, including all brick details, exams and courses, is offered in German language.

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

Workload

Lectures and exercises: 75 h

Homework and preparation of examination: 135 h

Recommendation

Technical Thermodynamics and Heat Transfer I

Learning type

Lecture

Exercise course

Tutorial

Literature

Script

Additional literature will be provided in the lecture.

M**10.78 Module: Theory of Probability [M-ETIT-102104]**

Responsible: Dr.-Ing. Holger Jäkel

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: Specialization in Mechatronics (Compulsory Elective Modules: Part 1: Electrical Engineering and Information Technology)

Specialization in Mechatronics (Compulsory Elective Modules: Part 3: Electrical Engineering and Information Technology, Mechanical Engineering, Informatics, Economics and Management)

Credits 5	Grading scale Grade to a tenth	Recurrence Each winter term	Duration 1 term	Language German	Level 2	Version 2
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Mandatory	
T-ETIT-101952	Theory of Probability

Competence Certificate

Type of examination: written exam. Duration of examination: approx. 120 minutes.

Prerequisites

Contents of higher mathematics are necessary (e.g. M-MATH-101731 and M-MATH-101732).

Recommendation

Contents of digital technologies are recommended (e.g. M-ETIT-102102).

11 Courses

T

11.1 Course: Philosophy of Technology Assessment - Proseminar [T-GEISTSOZ-111509]

Organisation: KIT Department of Humanities and Social Sciences

Part of: M-MACH-106583 - Key Competences

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	2

Events					
WT 23/24	5000046	Technikphilosophische Grundlagen der TA	2 SWS	Seminar / 	Hillerbrand, Frigo, Milchram
Exams					
WT 23/24	7400565	Philosophy of Technology Assessment - Proseminar			Hillerbrand

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

Annotation

Seminar Language in English

This seminar will be held in English language. The impact of technology on (human) nature and society is undeniably. Environmental disasters, advance in medical technology as well as advances in algorithms and increase computational power change the world we live in, changes human nature, and also the way we think about ourselves. Technologies raise particular philosophical questions and may put longstanding philosophical disputes in a different light. This course aims to highlight some recent developments in philosophy of technology, thereby focusing on ethical and epistemic aspects.

The course thereby addresses students with and without philosophical education so far and aims to provide the philosophical literacy as needed for technology assessment. The seminar expects participants for 2 credit points to read the papers provided (in English language), participate in the discussion in class, and hand in the course assignments (questions on the texts to be answered in written form). For more credit points, a written course assignment is required.

T**11.2 Course: Accessibility - Assistive Technologies for Visually Impaired Persons [T-INFO-101301]**

Responsible: Prof. Dr.-Ing. Rainer Stiefelhagen

Organisation: KIT Department of Informatics

Part of: [M-INFO-100764 - Accessibility - Assistive Technologies for Visually Impaired Persons](#)

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

T**11.3 Course: Actuators and Sensors in Nanotechnology [T-MACH-105238]**

Responsible: Prof. Dr. Manfred Kohl

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102698 - Actuators and Sensors in Nanotechnology

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

Events					
WT 23/24	2141866	Actuators and sensors in nanotechnology	2 SWS	Lecture / 	Kohl, Sommer
Exams					
WT 23/24	76-T-MACH-105238	Actuators and Sensors in Nanotechnology			Kohl, Sommer
ST 2024	76-T-MACH-105238	Actuators and Sensors in Nanotechnology			Kohl, Sommer

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

Competence Certificate

oral exam

Prerequisites

none

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

V**Actuators and sensors in nanotechnology**

2141866, WS 23/24, 2 SWS, Language: German, [Open in study portal](#)

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

T**11.4 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-106671 - Production 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 60 minutes

T**11.5 Course: Advanced Mathematics I [T-MATH-100275]**

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

Organisation: KIT Department of Mathematics

Part of: [M-MATH-102859 - Advanced Mathematics](#)

Type	Credits	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-requisite 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**11.6 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-requisite 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**11.7 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-requisite 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**11.8 Course: Algorithms I [T-INFO-100001]**

Responsible: TT-Prof. Dr. Thomas Bläsius
Organisation: KIT Department of Informatics
Part of: M-INFO-100030 - Algorithms I

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

Events					
ST 2024	24500	Algorithms I	4 SWS	Lecture / Practice (/)	Bläsius, Wilhelm, Yi, von der Heydt
Exams					
WT 23/24	7500117	Algorithms I			Bläsius
ST 2024	7500186	Algorithms I			Bläsius

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

T**11.9 Course: Bachelor's Thesis [T-MACH-113253]**

Responsible: Prof. Dr.-Ing. Marcus Geimer
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106579 - Bachelor's Thesis

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

Competence Certificate

The module Bachelor Thesis consists of a written elaboration (Bachelor Thesis) and an oral presentation of a self-chosen or given scientific topic. The students should show that they are able to work on a problem from their field of study independently and in a limited time according to scientific methods.

The date of the issue of the topic of the Bachelor's Thesis is to be recorded by the supervisor and the student and made a record of it at the Examination Board. The topic can only be returned once and only within the first month of the processing period. The Examination Board determines the languages in which the Bachelor's Thesis can be written.

The scope of the module Bachelor Thesis corresponds to 15 credit points (written elaboration 12 LP, oral presentation 3 LP). The topic and task must be adapted to the planned workload. For example, if the student works 30 hours per week, the thesis should be ready for submission after 12 weeks.

The maximum processing time is 6 months. The presentation must take place within the maximum processing time, but no later than six weeks after submission of the Bachelor Thesis. Upon justified application by the student, the Examination Board may extend the processing time by a maximum of one month. If the Bachelor's Thesis is not handed in on time, it is considered to be graded as "failed" (5.0), unless the student is not responsible for this failure.

The Bachelor Thesis is evaluated by at least one professor at KIT or a habilitated member of the KIT Department of Electrical Engineering and Information Technology or a habilitated member of the KIT Department of Mechanical Engineering and one further examiner. As a rule, one of the examiners is the person who assigned the thesis. In case of disagreement between these two persons, the Examination Board determines the grade of the Bachelor Thesis within the framework of the evaluation of these two persons; it may also appoint another examiner. The assessment must be made within six weeks after submission of the Bachelor Thesis.

Prerequisites

The requirement for admission to the Bachelor's Thesis module are 120 ECTS. As to exceptions, the Examination Board decides on a request of the student.

Final Thesis

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

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

This thesis requires confirmation by the examination office.

T**11.10 Course: Basic Electronic Circuits Laboratory [T-ETIT-101943]**

Responsible: Dr.-Ing. Armin Teltschik

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-102113 - Basic Electronic Circuits Laboratory

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (oral)	6	pass/fail	Each summer term	3

Events					
ST 2024	2303800	Basic Electronic Circuits Laboratory	4 SWS	Practical course /  Teltschik	

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

Competence Certificate

The success control takes place in the form of an oral final colloquium of approximately 20 minutes duration and during the internship by checking the completed test tasks.

To participate in the final colloque, at least 8 of the 9 attempts must be successfully completed. The successfully carried out experiments together with the final colloquium form an examination unit. If you fail, the internship must be repeated completely.

The event is not graded.

Prerequisites

Knowledge of the contents of the following modules ist necessary: „M-ETIT-102102 – Digitaltechnik“ and „M-ETIT-104465 – Elektronische Schaltungen“.

Annotation

To participate in the final colloque, at least 8 of the 9 attempts must be successfully completed. The successfully carried out experiments together with the final colloquium form an examination unit. If you fail, the internship must be repeated completely.

T**11.11 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.

T**11.12 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 studies

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

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

Part of: M-MACH-106535 - Basics of Manufacturing Technology

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

Responsible: Prof. Dr.-Ing. Jürgen Fleischer
Organisation: KIT Department of Mechanical Engineering
Part of: M-MACH-106671 - Production 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 60 minutes

Prerequisites

none

T**11.15 Course: Battery Modeling in MATLAB [T-ETIT-106507]**

Responsible: Dr.-Ing. Andre Weber

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-103271 - Battery Modeling in MATLAB

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

Events					
WT 23/24	2304228	Battery Modeling in MATLAB	1 SWS	Lecture / 	Weber
WT 23/24	2304229	Tutorial for 2304228 Battery Modeling in MATLAB	1 SWS	Practice / 	Weber
Exams					
WT 23/24	7304228	Battery Modeling in MATLAB			Weber

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

Prerequisites

none

T**11.16 Course: CAE-Workshop [T-MACH-105212]**

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

Part of: M-MACH-102684 - CAE-Workshop

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	4	Grade to a third	Each term	2

Events					
WT 23/24	2147175	CAE-Workshop	3 SWS	Block /	Albers, Düser
ST 2024	2147175	CAE-Workshop	3 SWS	Block /	Albers, Düser

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

Competence Certificate

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

Prerequisites

None

Annotation

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

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

V**CAE-Workshop**

2147175, WS 23/24, 3 SWS, Language: German, [Open in study portal](#)

**Block (B)
On-Site**

Content

Content:

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

The students are able to:

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

Regular attendance: 31.5 h

Self-study: 88.5 h

Exam: 1h written

Organizational issues

Wir empfehlen den Workshop ab dem 5. Semester.

Anmeldung erforderlich. Weitere Informationen siehe IPEK-Homepage.

Anwesenheitspflicht

Literature

Kursunterlagen werden in Ilias bereitgestellt.

Content is provided on Ilias.

V**CAE-Workshop**2147175, SS 2024, 3 SWS, Language: German, [Open in study portal](#)**Block (B)
On-Site****Content**

Content:

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

The students are able to:

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

Exam: 1h Regularly written

Regular attendance: 31.5 h

Self-study: 88.5 h

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

Organizational issues

Wir empfehlen den Workshop ab dem 5. Semester.

Anmeldung erforderlich. Weitere Informationen siehe IPEK-Homepage.

Anwesenheitspflicht

Literature

Kursunterlagen werden in Ilias bereitgestellt.

Content is provided on Ilias.

T**11.17 Course: Communications Engineering II [T-ETIT-110697]**

Responsible: Dr.-Ing. Holger Jäkel
Prof. Dr.-Ing. Laurent Schmalen

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-105274 - Communications Engineering II

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

Events					
WT 23/24	2310509	Communications Engineering II	2 SWS	Lecture /	Jäkel
WT 23/24	2310510	Übung zu 2310509 Communications Engineering II	1 SWS	Practice /	Jäkel
ST 2024	2310511	Communications Engineering II	2 SWS	Lecture /	Jäkel
ST 2024	2310513	Tutorial for 2310511 Communications Engineering II	1 SWS	Practice /	Jäkel
Exams					
WT 23/24	7310511	Communications Engineering II			Jäkel
ST 2024	7310511	Communications Engineering II			Jäkel

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

Competence Certificate

The assessment will be carried out in the form of a written exam of 120 minutes. The module grade is the grade of the written exam.

Prerequisites

none

Recommendation

Knowledge of basic engineering mathematics including integral transformations and probability theory as well as basic knowledge of communications engineering.

Previous visit to the lecture "Communications Engineering I", "Probability Theory" and "Signals and Systems" is recommended.

T**11.18 Course: Computer Organization [T-INFO-103531]**

Responsible: Prof. Dr. Wolfgang Karl
Organisation: KIT Department of Informatics
Part of: M-INFO-103179 - Computer Organization

Type	Credits	Grading scale	Version
Written examination	6	Grade to a third	1

Events					
WT 23/24	24502	Computer Organization	3 SWS	Lecture	Henkel, Lehmann
WT 23/24	24505	Übungen zu Rechnerorganisation	2 SWS	Practice	Lehmann
Exams					
WT 23/24	7500228	Computer Organization			Henkel

T**11.19 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 studies

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**11.20 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

11.21 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

11.22 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**11.23 Course: Electric Energy Systems [T-ETIT-101923]**

Responsible: Prof. Dr.-Ing. Thomas Leibfried
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-102156 - Electric Energy Systems

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

Events					
ST 2024	2307391	Electric Energy Systems	2 SWS	Lecture / 	Leibfried
ST 2024	2307393	Übungen zu 2307391 Elektroenergiesysteme	1 SWS	Practice / 	Eser
Exams					
WT 23/24	7307391	Electric Energy Systems			Leibfried

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

Prerequisites

none

T**11.24 Course: Electric Energy Systems [T-ETIT-112850]**

Responsible: Prof. Dr.-Ing. Marc Hiller
Prof. Dr.-Ing. Thomas Leibfried

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-106337 - Electric Energy Systems](#)

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

Prerequisites

none

T**11.25 Course: Electromagnetic Fields [T-ETIT-113004]**

Responsible: Prof. Dr. Martin Doppelbauer

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-106419 - Electromagnetic Fields](#)

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

Prerequisites

none

T**11.26 Course: Electromagnetic Waves [T-ETIT-113084]**

Responsible: Prof. Dr.-Ing. Sebastian Randel

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-106471 - Electromagnetic Waves](#)

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

Prerequisites

none

T**11.27 Course: Electronic Devices and Circuits [T-ETIT-109318]**

Responsible: Prof. Dr.-Ing. Ahmet Cagri Ulusoy

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-104465 - Electronic Devices and Circuits

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

Events					
ST 2024	2308655	Electronic Devices and Circuits	3 SWS	Lecture / 	Ulusoy
ST 2024	2308657	Übungen zu 2312655 Elektronische Schaltungen	1 SWS	Practice / 	Ulusoy
ST 2024	2308658	Tutorien zu 2312655 Elektronische Schaltungen	1 SWS	/ 	Ulusoy
Exams					
WT 23/24	7308655	Electronic Devices and Circuits			Ulusoy

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

T**11.28 Course: Electronic Devices and Circuits - Workshop [T-ETIT-109138]****Responsible:** Prof. Dr.-Ing. Thomas Zwick**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** [M-ETIT-104465 - Electronic Devices and Circuits](#)

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

Events					
ST 2024	2308450	Elektronische Schaltungen - Workshop	1 SWS	Practical course /  Zwick	

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

T**11.29 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-106549 - 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**11.30 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 theories 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**11.31 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**11.32 Course: Ethics of Technology - ARs ReflecTlonis [T-ETIT-111923]****Responsible:** Dr. phil. Michael Kühler**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** M-MACH-106583 - Key Competences

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

Events					
WT 23/24	9003013	ARS REFLECTIONIS. Thinking and Acting Responsibly in Engineering, Science, and Innovation		Block /	Kühler, Does
ST 2024	9003013	ARS REFLECTIONIS. Thinking and Acting Responsibly in Engineering, Science, and Innovation		Block /	Kühler, Does
Exams					
WT 23/24	9900017	ARS REFLECTIONIS. Thinking and Acting Responsibly in Engineering, Science, and Innovation			

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

Prerequisites

none

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

V**ARS REFLECTIONIS. Thinking and Acting Responsibly in Engineering, Science, and Innovation**Block (B)
Online9003013, WS 23/24, SWS, Language: German, [Open in study portal](#)**Content**

ARs ReflecTlonis is an online modular self-study course. Its aim is to enable students to reflect critically on ethical challenges of their disciplines and their later professional work. The course allows for combining general components on ethics and normative argumentation with components on concrete questions about responsible decision-making, tailor-made for specific areas of study at the KIT. Each component consists of a video micro-lecture, which can be viewed on ILIAS, and further material for self-study. Optionally, Q&A sessions and workshops are offered to give students the opportunity to ask questions individually and discuss the topics directly and more in-depth with teachers. The course is completed via a multiple-choice test.

The course is offered—and continually developed further—by the Academy for Responsible Research, Teaching, and Innovation (ARRTI) in cooperation with the

House of Competence (HoC).

Workload:

2 ECTS: Multiple Choice Test

Weitere Infos und Links:<https://www.arrti.kit.edu/736.php>**Organizational issues**

Onlinekurs im Selbststudium: Zur Teilnahme bitte auf studium@hoc.kit.edu und auf Ilias anmelden. Anmeldung jederzeit möglich

V**ARS REFLECTIONIS. Thinking and Acting Responsibly in Engineering, Science, and Innovation**Block (B)
Online9003013, SS 2024, SWS, Language: German, [Open in study portal](#)

Content

ARs ReflecTlonis is an online modular self-study course. Its aim is to enable students to reflect critically on ethical challenges of their disciplines and their later professional work. The course allows for combining general components on ethics and normative argumentation with components on concrete questions about responsible decision-making, tailor-made for specific areas of study at the KIT. Each component consists of a video micro-lecture, which can be viewed on ILIAS, and further material for self-study. Optionally, Q&A sessions and workshops are offered to give students the opportunity to ask questions individually and discuss the topics directly and more in-depth with teachers. The course is completed via a multiple-choice test.

The course is offered – and continually developed further – by the Academy for Responsible Research, Teaching, and Innovation (ARRTI) in cooperation with the House of Competence (HoC).

No maximum number of participants. Registration possible at any time.

Additional information and links can be found here:

<https://www.artt.kit.edu/736.php>

Work Expenditure:

2 ECTS: Multiple Choice Test

Lecturers:

Michael Kühler and Elisabeth Does are research associates at the Academy for Responsible Research, Teaching, and Innovation (ARRTI) at KIT. In the "Teaching" team, they are responsible for developing and offering innovative event offerings around questions of ethics and responsibility. Together they support students in developing their ability for critical ethical reflection.

Michael Kühler has a broad philosophical as well as special expertise in technology ethics and can support students especially in these areas.

Elisabeth Does has expertise in philosophy as well as social and economic sciences and can support students especially in interdisciplinary issues.

Organizational issues

Onlinekurs im Selbststudium: Zur Teilnahme bitte auf studium.hoc.kit.edu und auf IlIAS anmelden.

Keine Teilnahmebeschränkung, Anmeldung fortlaufend möglich.

T**11.33 Course: Examination Material Science I & II [T-MACH-105148]**

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

Part of: M-MACH-102567 - Material Science and Engineering

Type	Credits	Grading scale	Recurrence	Version
Oral examination	9	Grade to a third	Each winter term	1

Events					
WT 23/24	2181555	Materials Science and Engineering I for ciw, vt, MIT	4 SWS	Lecture / Practice (/)	Schneider
ST 2024	2182562	Materials Science and Engineering II for ciw, vt, mit	4 SWS	Lecture / Practice (/)	Schneider
Exams					
WT 23/24	76-T-MACH-105148	Examination Material Science I, II		Schneider	

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

Competence Certificate

oral; 30 to 40 minutes

No tools and reference tools are allowed!

Prerequisites

none

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

V**Materials Science and Engineering I for ciw, vt, MIT**

2181555, WS 23/24, 4 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)
On-Site**

Content

Atomic structure and atomic bonds

Structures of crystalline and amorphous solids

Defects in crystalline solids

Alloys

Transport and transformation phenomena in the solid state

Corrosion

Wear

Mechanical properties

Testing of materials

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

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

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

regular attendance: 45 hours

self-study: 75 hours

Oral exam in combination with Materials Science and Engineering II; oral; 30 to 40 minutes

No tools and reference tools are allowed!

Literature

Vorlesungsskript

Aufgabenblätter

W. Bergmann: Werkstofftechnik I + II, Hanser Verlag, München, 2008/9

M. Merkel: Taschenbuch der Werkstoffe, Hanser Verlag, München, 2008

R. Schwab: Werkstoffkunde und Werkstoffprüfung für Dummies, Wiley VCH, Weinheim, 2019

J.F. Shackelford: Werkstofftechnologie für Ingenieure, Pearson Studium, München, 2007

J.F. Shackelford: Introduction to Materials Science for Engineers. Pearson, 2014

W. D. Callister: Materials Science and Engineering. John Wiley & Sons, 2020

M. Ashby: Materials. Elsevier, 2018

M. Ashby: Materials Selection in Mechanical Design. Elsevier, 2016

V**Materials Science and Engineering II for ciw, vt, mit**2182562, SS 2024, 4 SWS, Language: German, [Open in study portal](#)**Lecture / Practice (VÜ)**
On-Site**Content**

Ferrous materials

Non-ferrous metals and alloys

Polymers

Engineering ceramics

Composites

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

The students can name representative materials for different material classes and can describe the differences.

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

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

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

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

regular attendance: 45 hours

self-study: 105 hours

Combined oral exam with Materials Science and Engineering I; 30 to 40 minutes

No tools and reference tools are allowed!

Literature

Vorlesungsskript

Übungsaufgabenblätter

W. Bergmann: Werkstofftechnik I + II, Hanser Verlag, München, 2008/9

M. Merkel: Taschenbuch der Werkstoffe, Hanser Verlag, München, 2008

R. Schwab: Werkstoffkunde und Werkstoffprüfung für Dummies, Wiley VCH, Weinheim, 2011

J.F. Shackelford: Werkstofftechnologie für Ingenieure, Pearson Studium, München, 2008 (E-Book)

T**11.34 Course: Excercises in Technical Thermodynamics and Heat Transfer I [T-MACH-105204]**

Responsible: Prof. Dr. Ulrich Maas

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-102386 - Technical Thermodynamics and Heat Transfer I

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

Events					
WT 23/24	2165502	Exercise course Technical Thermodynamics and Heat Transfer I	2 SWS	Practice / 	Maas
WT 23/24	3165015	Technical Thermodynamics and Heat Transfer I (Tutorial)	2 SWS	Tutorial (/ 	Schießl, Maas
Exams					
WT 23/24	76-T-MACH-105204	Excercises in Technical Thermodynamics and Heat Transfer I			Maas, Schießl
ST 2024	76-T-MACH-105204	Excercises in Technical Thermodynamics and Heat Transfer I			Maas, Schießl

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

Competence Certificate

Successful completion of written preliminary tests.

Prerequisites

none

T**11.35 Course: Excercises in Technical Thermodynamics and Heat Transfer II [T-MACH-105288]****Responsible:** Prof. Dr. Ulrich Maas**Organisation:** KIT Department of Mechanical Engineering**Part of:** M-MACH-102830 - Technical Thermodynamics and Heat Transfer II

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

Events					
WT 23/24	2100020	Technical Thermodynamics and Heat Transfer II (Repeater Tutorial)	2 SWS	Tutorial (/)	Schießl
ST 2024	2166556	Technical Thermodynamics and Heat Transfer II (Tutorial)	2 SWS	Practice / ()	Maas
ST 2024	3166033	Technical Thermodynamics and Heat Transfer II (Tutorial)	2 SWS	Practice / ()	Schießl, Maas
Exams					
WT 23/24	76-T-MACH-105288	Excercises in Technical Thermodynamics and Heat Transfer II			Maas, Schießl
ST 2024	76-T-MACH-105288	Excercises in Technical Thermodynamics and Heat Transfer II			Maas

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

Competence Certificate

Successful completion of written preliminary tests.

Prerequisites

none

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

V**Technical Thermodynamics and Heat Transfer II (Tutorial)**2166556, SS 2024, 2 SWS, Language: German, [Open in study portal](#)**Practice (Ü)****On-Site****Content**

Calculation of thermodynamical problems

Literature

Vorlesungsskriptum

Elsner, N.; Dittmann, A.: Energielehre und Stoffverhalten (Grundlagen der technischen Thermodynamik Bd. 1 und 2), 8. Aufl., Akademie-Verlag, 680 S. 1993.

Baehr, H.D.: Thermodynamik: eine Einführung in die Grundlagen und ihre technischen Anwendungen, 9. Aufl., Springer-Verlag, 460 S., 1996.

T**11.36 Course: Fluid Mechanics [T-MACH-112933]**

Responsible: Prof. Dr.-Ing. Bettina Frohnäpfel

Organisation: KIT Department of Mechanical Engineering

Part of: [M-MACH-106378 - Fluid Mechanics](#)

[M-MACH-106668 - Fluid Mechanics and Technical Thermodynamics and Heat Transfer I](#)

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**11.37 Course: Fundamentals of Data Transmission [T-ETIT-112851]**

Responsible: Prof. Dr.-Ing. Laurent Schmalen
Prof. Dr.-Ing. Thomas Zwick

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-106338 - Fundamentals of Data Transmission](#)

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

Competence Certificate

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

Prerequisites

none

T**11.38 Course: Fundamentals of Digital Technology [T-ETIT-112872]**

Responsible: Prof. Dr.-Ing. Jürgen Becker
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-106407 - Fundamentals of Digital Technology

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

Events					
WT 23/24	2311613	Accompanying group tutorial for 2311615 Digital Technology / Fundamentals of Digital Technology		Tutorial (/ ●)	Höfer
WT 23/24	2311615	Digital Technology / Fundamentals of Digital Technology	3 SWS	Lecture / ☰	Becker
WT 23/24	2311617	Tutorial for 2311615 Digital Technology / Fundamentals of Digital Technology	1 SWS	Practice / ☰	Höfer
Exams					
WT 23/24	73116152	Fundamentals of Digital Technology			Becker

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

Prerequisites

none

T**11.39 Course: Human-Machine-Interaction [T-INFO-101266]**

Responsible: Prof. Dr.-Ing. Michael Beigl
Organisation: KIT Department of Informatics
Part of: M-INFO-100729 - Human Computer Interaction

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

Events					
ST 2024	24659	Human-Computer-Interaction	2 SWS	Lecture / 	Beigl, Lee
Exams					
WT 23/24	7500076	Human-Machine-Interaction			Beigl

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

Modeled Conditions

The following conditions have to be fulfilled:

1. The course T-INFO-106257 - Human-Machine-Interaction Pass must have been passed.

T**11.40 Course: Human-Machine-Interaction Pass [T-INFO-106257]**

Responsible: Prof. Dr.-Ing. Michael Beigl
Organisation: KIT Department of Informatics
Part of: M-INFO-100729 - Human Computer Interaction

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

Events					
ST 2024	2400095	Human-Computer-Interaction	1 SWS	Practice / 	Beigl, Lee
ST 2024	24659	Human-Computer-Interaction	2 SWS	Lecture / 	Beigl, Lee

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

T**11.41 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-ETIT-100514 - Hybrid and Electric Vehicles

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**11.42 Course: Image Processing [T-ETIT-105566]**

Responsible: Prof. Dr.-Ing. Michael Heizmann

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-102651 - Image Processing

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

Events					
ST 2024	2302114	Bildverarbeitung	2 SWS	Lecture / 	Heizmann
Exams					
WT 23/24	7302114	Image Processing			Heizmann

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

Prerequisites

none

T**11.43 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**11.44 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**11.45 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**11.46 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**11.47 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**11.48 Course: Information and Automation Technology [T-ETIT-112878]**

Responsible: Prof. Dr.-Ing. Mike Barth

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-106336 - Information and Automation Technology

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

Events					
ST 2024	2303185	Informationstechnik und Automatisierungstechnik	3 SWS	Lecture / 	Barth
ST 2024	2303186	Übung zu Informationstechnik und Automatisierungstechnik	1 SWS	Practice / 	Madsen
Exams					
ST 2024	7300024	Information and Automation Technology			Barth

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

Competence Certificate

The success check takes the form of a written exam lasting 120 minutes.

Prerequisites

none

T**11.49 Course: Information and Automation Technology - Lab Course [T-ETIT-112879]**

Responsible: Prof. Dr.-Ing. Eric Sax

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-106336 - Information and Automation Technology

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each summer term	1 terms	1

Events					
ST 2024	2311653	Laboratory on Information Technology I	1 SWS	Practical course / ☒	Sax

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

Competence Certificate

A performance check in the form of a coursework consisting of project documentation and checking the source code as part of the internship course

Prerequisites

none

T**11.50 Course: Internship [T-MACH-113256]**

Responsible: Prof. Dr. Martin Doppelbauer
Prof. Dr.-Ing. Marcus Geimer

Organisation: KIT Department of Mechanical Engineering

Part of: [M-MACH-106582 - Internship](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	15	pass/fail	Each term	1

Competence Certificate

During the bachelor's program, students are required to complete an internship of at least 13 weeks, which is suitable for giving students an insight into practical work in the field of mechatronics and information technology. 15 credit points are assigned to the professional internship.

For the recognition of the professional internship, a **proof of activity (internship certificate)** of the company with the type and duration of the internship **and an internship report are required**.

Both documents must be confirmed by the company by signature. Company here stands synonymously for firms, companies, etc., which include a recognized training facility (but not, for example, a GbR). The nature of the individual activities must be evident from the proof. In case of ambiguity, the trainee's certificate, the traineeship contract, or further evidence can also be requested in the original.

Prerequisites

None

Recommendation

If the professional internship was performed during periods in which the student was not enrolled, the application for recognition must be submitted within the first semester after enrollment in accordance with § 19 paragraph 2 of the Bachelor Study and Examination Regulations.

Annotation

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

T**11.51 Course: Introduction to High Voltage Engineering [T-ETIT-110702]**

Responsible: Dr.-Ing. Michael Suriyah

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-105276 - Introduction to High Voltage Engineering

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

Events					
ST 2024	2307395	Introduction to High Voltage Engineering	2 SWS	Lecture / 	Suriyah
Exams					
WT 23/24	7307396	Introduction to High Voltage Engineering			Suriyah
ST 2024	7307395	Introduction to High Voltage Engineering			Suriyah

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

Competence Certificate

Oral exam approx. 20 min.

Prerequisites

none

Recommendation

Basic knowledge in network theory, field theory and electrical metrology

T**11.52 Course: Introduction to Operations Research I and II [T-WIWI-102758]**

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

Organisation: KIT Department of Economics and Management

Part of: M-WIWI-101418 - Introduction to Operations Research

Type	Credits	Grading scale	Recurrence	Version
Written examination	9	Grade to a third	see Annotations	2

Events					
WT 23/24	2500030	Computer Exercises on Introduction to Operations Research II	1 SWS	Tutorial (/)	Dunke
WT 23/24	2530043	Introduction to Operations Researchn II	2 SWS	Lecture /	Rebennack
WT 23/24	2530044			Tutorial (/)	Dunke
ST 2024	2500008	Computer Exercises on Introduction to Operations Research I	1 SWS	Tutorial (/)	Dunke
ST 2024	2550040	Introduction to Operations Research I	2 SWS	Lecture ()	Nickel
ST 2024	2550043	Tutorials on Introduction to Operations Research I	2 SWS	Tutorial (/)	Dunke
Exams					
WT 23/24	7900209	Introduction to Operations Research I and II			Rebennack

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

Competence Certificate

The assessment of the module is carried out by a written examination (120 minutes) according to Section 4(2), 1 of the examination regulation.

In each term (usually in March and August), one examination is held for both courses.

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

Prerequisites

None

Recommendation

Knowledge of Mathematics I and II is recommended, as well as programming knowledge for the software laboratory.

It is strongly recommended to attend the course Introduction to Operations Research I

[2550040] before attending the course Introduction to Operations Research II [2530043].

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

V**Introduction to Operations Researchn II**

2530043, WS 23/24, 2 SWS, [Open in study portal](#)

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

Content

Integer and combinatorial optimization: basic concepts, cutting plane methods, branch-and-bound methods, branch-and-cut methods, heuristic methods.

Nonlinear optimization: basic concepts, optimality conditions, solution methods for convex and nonconvex optimization problems.

Dynamic and stochastic models and methods: Dynamic optimization, Bellman methods, lot-sizing models and dynamic and stochastic models of inventory, queues.

Learning Objectives:

The student

- knows and describes the basic concepts of integer and combinatorial optimization, nonlinear optimization and dynamic optimization,
- knows the methods and models indispensable for a quantitative analysis,
- models and classifies optimization problems and selects appropriate solution procedures to solve simple optimization problems independently,
- validates, illustrates and interprets obtained solutions.

Literature

- Nickel, Stein, Waldmann: Operations Research, 2. Auflage, Springer, 2014
- Hillier, Lieberman: Introduction to Operations Research, 8th edition. McGraw-Hill, 2005
- Murty: Operations Research. Prentice-Hall, 1995
- Neumann, Morlock: Operations Research, 2. Auflage. Hanser, 2006
- Winston: Operations Research - Applications and Algorithms, 4th edition. PWS-Kent, 2004

V**Introduction to Operations Research I**2550040, SS 2024, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)
On-Site**

Content

Examples for typical OR problems.

Linear Programming: Basic notions, simplex method, duality, special versions of the simplex method (dual simplex method, three phase method), sensitivity analysis, parametric optimization, game theory.

Graphs and Networks: Basic notions of graph theory, shortest paths in networks, project scheduling, maximal and minimal cost flows in networks.

Learning objectives:

The student

- names and describes basic notions of linear programming as well as graphs and networks,
- knows the indispensable methods and models for quantitative analysis,
- models and classifies optimization problems and chooses the appropriate solution methods to solve optimization problems independently,
- validates, illustrates and interprets the obtained solutions.

Literature

- Nickel, Rebennack, Stein, Waldmann: Operations Research, 3. Auflage, Springer, 2022
- Hillier, Lieberman: Introduction to Operations Research, 8th edition. McGraw-Hill, 2005
- Murty: Operations Research. Prentice-Hall, 1995
- Neumann, Morlock: Operations Research, 2. Auflage. Hanser, 2006
- Winston: Operations Research - Applications and Algorithms, 4th edition. PWS-Kent, 2004

T**11.53 Course: Introduction to Systems Engineering and AI-Methods [T-ETIT-113087]**

Responsible: Prof. Dr.-Ing. Eric Sax

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-106474 - Systems Engineering and AI-Methods](#)

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

Prerequisites

none

T**11.54 Course: Introduction to Video Analysis [T-INFO-101273]**

Responsible: Prof. Dr.-Ing. Jürgen Beyerer
Organisation: KIT Department of Informatics
Part of: M-INFO-100736 - Introduction to Video Analysis

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

Events					
ST 2024	24684	Introduction to Video Analysis	2 SWS	Lecture / 	Arens
Exams					
WT 23/24	7500099	Introduction to Video Analysis			Beyerer, Arens

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

T**11.55 Course: Laboratory Circuit Design [T-ETIT-100788]**

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

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-100518 - Laboratory Circuit Design

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

Events					
WT 23/24	2311638	Laboratory Circuit Design	4 SWS	Practical course /  Becker	
Exams					
WT 23/24	7311638	Laboratory Circuit Design			Becker

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

Prerequisites

none

T**11.56 Course: Laboratory for Applied Machine Learning Algorithms [T-ETIT-109839]**

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

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-104823 - Laboratory for Applied Machine Learning Algorithms

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

Events					
WT 23/24	2311650	Laboratory for Applied Machine Learning Algorithms	4 SWS	Practical course / 	Sax, Stork, Becker
Exams					
WT 23/24	7311650	Laboratory for Applied Machine Learning Algorithms			Sax, Stork, Becker

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

Prerequisites

none

T**11.57 Course: Laboratory Hardware and Software in Power Electronic Systems [T-ETIT-106498]**

Responsible: Prof. Dr.-Ing. Marc Hiller

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-103263 - Laboratory Hardware and Software in Power Electronic Systems

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

Events					
WT 23/24	2306346	Laboratory Hardware and Software in Power Electronic Systems	4 SWS	Practical course /	Hiller, Swoboda, Cujic
ST 2024	2306346	Laboratory Hardware and Software in Power Electronic Systems	4 SWS	Practical course /	Hiller, Swoboda, Cujic
Exams					
WT 23/24	7306346	Laboratory Hardware and Software in Power Electronic Systems			Hiller, Stoß

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

Prerequisites

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

T**11.58 Course: Laboratory Systems Engineering and AI-Methods [T-ETIT-113146]**

Responsible: Prof. Dr.-Ing. Eric Sax

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-106474 - Systems Engineering and AI-Methods](#)

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

Prerequisites

none

T**11.59 Course: Linear Electronic Networks [T-ETIT-113001]**

Responsible: Prof. Dr.-Ing. John Jelonnek
 Prof. Dr. Sebastian Kempf

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-106417 - Linear Electric Circuits](#)

[M-MACH-106549 - Orientation Exam](#)

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

Events					
WT 23/24	2305256	Linear Electric Circuits	4 SWS	Lecture / 	Kempf, Jelonnek
Exams					
WT 23/24	7305256	Linear Electronic Networks			Kempf, Jelonnek

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

Prerequisites

none

T**11.60 Course: Linear Electronic Networks - Workshop A [T-ETIT-109317]**

Responsible: Prof. Dr.-Ing. Thomas Leibfried
Prof. Dr. Ulrich Lemmer

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-106417 - Linear Electric Circuits](#)

[M-MACH-106549 - Orientation Exam](#)

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

Events					
WT 23/24	2313732	Linear Electric Circuits - Workshop A	1 SWS	Practical course /  Lemmer	
Exams					
WT 23/24	7313732	Linear Electronic Networks - Workshop A		Lemmer	

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

Prerequisites

none

T**11.61 Course: Linear Electronic Networks - Workshop B [T-ETIT-109811]**

Responsible: Prof. Dr. Werner Nahm

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-106417 - Linear Electric Circuits](#)
[M-MACH-106549 - Orientation Exam](#)

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

Events					
WT 23/24	2307306	Linear Electronic Networks Workshop B	1 SWS	Practical course / 	Leibfried
WT 23/24	2307400	Linear Electronic Networks - Workshop B	1 SWS	Practical course / 	Leibfried
Exams					
WT 23/24	7307400	Linear Electronic Networks - Workshop B			Leibfried

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

T**11.62 Course: Measurement and Control Technology [T-ETIT-112852]**

Responsible: Prof. Dr.-Ing. Michael Heizmann
Prof. Dr.-Ing. Sören Hohmann

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-106339 - Measurement and Control Technology](#)

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

Competence Certificate

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

Prerequisites

none

T**11.63 Course: Mechanical Design A [T-MACH-112984]**

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

Part of: M-MACH-106527 - Mechanical Design A

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, Dürer
Exams					
WT 23/24	76T-MACH-112984	Mechanical Design A			Matthiesen, Dürer
ST 2024	76T-MACH-112984	Mechanical Design A			Matthiesen, Dürer

Competence Certificate

Written exam with a duration of 90 Minutes

Prerequisites

Admission to the exam only with successful 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**11.64 Course: Mechanical Design A, Workshop [T-MACH-112981]**

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

Part of: M-MACH-106527 - Mechanical Design A

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	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**11.65 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-106528 - Mechanical Design B-C

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, Dürer
ST 2024	2146201	Exercises for Mechanical Design B	1 SWS	Practice / 	Matthiesen, Dürer

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 successful 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**11.66 Course: Mechanical Design B, Workshop [T-MACH-112982]**

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

Part of: M-MACH-106528 - Mechanical Design B-C

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, Dürer

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**11.67 Course: Mechanical Design C, Workshop [T-MACH-112983]**

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

Part of: [M-MACH-106528 - Mechanical Design B-C](#)

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**11.68 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-106493 - Mechatronical Systems and Products

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	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**11.69 Course: Medical Imaging Technology I [T-ETIT-113048]**

Responsible: Prof. Dr. Maria Francesca Spadea

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-106449 - Medical Imaging Technology I

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

Events					
WT 23/24	2305261	Medical Imaging Technology I	2 SWS	Lecture	Spadea
Exams					
WT 23/24	7305012	Medical Imaging Technology I			Spadea
ST 2024	7305261	Medical Imaging Technology I			Spadea

Competence Certificate

The examination takes place in form of a written examination lasting 60 minutes. The course grade is the grade of the written exam.

Prerequisites

none

T**11.70 Course: Medical Imaging Technology II [T-ETIT-113421]**

Responsible: Prof. Dr. Maria Francesca Spadea

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-106670 - Medical Imaging Technology II

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

Events					
ST 2024	2305262	Medical Imaging Technology II	2 SWS	Lecture / 	Spadea
Exams					
ST 2024	7305262	Medical Imaging Technology II			Spadea

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

Competence Certificate

The examination takes place in form of a written examination lasting 60 minutes. The course grade is the grade of the written exam.

Prerequisites

none

T**11.71 Course: Methods for Automation, Control Engineering and Robotics [T-ETIT-112903]**

Responsible: Prof. Dr.-Ing. Sören Hohmann

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-106373 - Methods for Automation, Control Engineering and Robotics](#)

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

Prerequisites

none

T**11.72 Course: Microenergy Technologies [T-MACH-105557]****Responsible:** Prof. Dr. Manfred Kohl**Organisation:** KIT Department of Mechanical Engineering**Part of:** M-MACH-102714 - Microenergy Technologies

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

Events					
ST 2024	2142897	Microenergy Technologies	2 SWS	Lecture / 	Kohl
Exams					
WT 23/24	76-T-MACH-105557	Microenergy Technologies			Kohl
ST 2024	76-T-MACH-105557	Microenergy Technologies			Kohl

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

Oral examination (30 Min.)

Prerequisites

none

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

V**Microenergy Technologies**2142897, SS 2024, 2 SWS, Language: English, [Open in study portal](#)Lecture (V)
On-Site**Content**

- Basic physical principles of energy conversion
- Layout and design optimization
- Technologies
- Selected devices
- Applications

The lecture includes amongst others the following topics:

- Micro energy harvesting of vibrations using different conversion principles (piezo, electrostatic, electromagnetic, etc.)
- Thermoelectric energy generation
- Novel thermal energy conversion principles (thermomagnetic, pyroelectric)
- Miniature scale solar devices
- RF energy harvesting
- Miniature scale heat pumping
- Solid-state cooling technologies (magneto-, electro-, mechanocalorics)
- Power management
- Energy storage technologies (microbatteries, supercapacitors, fuel cells)

Literature

- Folienskript "Micro Energy Technologies"
- Stephen Beeby, Neil White, Energy Harvesting for Autonomous Systems, Artech House, 2010
- Shashank Priya, Daniel J. Inman, Energy Harvesting Technologies, Springer, 2009

T**11.73 Course: Mobile Computing and Internet of Things [T-INFO-102061]**

Responsible: Prof. Dr.-Ing. Michael Beigl

Organisation: KIT Department of Informatics

Part of: [M-INFO-101249 - Mobile Computing and Internet of Things](#)

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

Events					
WT 23/24	2400051	Mobile Computing and Internet of Things	2+1 SWS	Lecture / Practice (Beigl, Röddiger
Exams					
WT 23/24	7500287_1	Mobile Computing and Internet of Things			Beigl

Modeled Conditions

The following conditions have to be fulfilled:

1. The course [T-INFO-113119 - Mobile Computing and Internet of Things - Exercise](#) must have been started.

T**11.74 Course: Mobile Computing and Internet of Things - Exercise [T-INFO-113119]****Responsible:** Prof. Dr.-Ing. Michael Beigl**Organisation:** KIT Department of Informatics**Part of:** M-INFO-101249 - Mobile Computing and Internet of Things

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	2,5	Grade to a third	Each winter term	2

Events					
WT 23/24	2400051	Mobile Computing and Internet of Things	2+1 SWS	Lecture / Practice (Beigl, Röddiger
Exams					
WT 23/24	7500358	Mobile Computing and Internet of Things			Beigl

T**11.75 Course: Modelling and Simulation [T-MACH-100300]**

Responsible: Prof. Dr. Peter Gumsch
Prof. Dr. Britta Nestler

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-100296 - Modelling and Simulation

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

Events					
WT 23/24	2183703	Numerical methods and simulation techniques	3 SWS	Lecture / Practice (/)	Nestler, August, Prahs
ST 2024	2183703	Modelling and Simulation	2+1 SWS	Lecture / Practice (/)	Nestler, August, Prahs
Exams					
WT 23/24	76-T-MACH-100300	Modelling and Simulation			Nestler, August, Prahs

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

Competence Certificate

Successful participation in the computer internship (ungraded) and written exam, 90 min (graded)

Prerequisites

none

Recommendation

preliminary knowledge in mathematics, physics and materials science

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

V**Numerical methods and simulation techniques**

2183703, WS 23/24, 3 SWS, Language: German, [Open in study portal](#)

**Lecture / Practice (VÜ)
On-Site**

Content

The course gives an introduction to modelling and simulation techniques.

The following topics are included:

- splines, interpolation methods, Taylor series
- finite difference method
- dynamical systems
- numerics of partial differential equations
- mass and heat diffusion
- microstructure simulation
- parallel and adaptive algorithms
- high performance computing
- practical exercises

The student can

- explain the basic algorithms and numerical methods which are beside other applications relevant for materials simulations.
- describe and apply numerical solution methods for partial differential equations and dynamical systems
- apply numerical methods to solve heat and mass diffusion problems which can also be used to model microstructure formation processes
- has experiences in how to implement and program the introduced numerical methods from an integrated computer lab.

preliminary knowlegde in mathematics, physics and materials science recommended

regular attendance: 22,5 hours lecture, 11,5 hours exercises

self-study: 116 hours

We regularly hand out exercise sheets. In addition, the course will be accompanied by practical exercises at the computer.

written examination: 90 minutes

Organizational issues

Termine für Rechnerübungen werden in der Vorlesung bekannt gegeben!

Literature

1. Scientific Computing, G. Golub and J.M. Ortega (B.G.Teubner Stuttgart 1996)

V

Modelling and Simulation

2183703, SS 2024, 2+1 SWS, Language: German, [Open in study portal](#)

Lecture / Practice (VÜ)
On-Site

Content

The course gives an introduction to modelling and simulation techniques.

The following topics are included:

- splines, interpolation methods, Taylor series
- finite difference method
- dynamical systems
- numerics of partial differential equations
- mass and heat diffusion
- microstructure simulation
- parallel and adaptive algorithms
- high performance computing
- practical exercises

The student can

- explain the basic algorithms and numerical methods which are beside other applications relevant for materials simulations.
- describe and apply numerical solution methods for partial differential equations and dynamical systems
- apply numerical methods to solve heat and mass diffusion problems which can also be used to model microstructure formation processes
- has experiences in how to implement and program the introduced numerical methods from an integrated computer lab.

preliminary knowlegde in mathematics, physics and materials science recommended

regular attendance: 22,5 hours lecture, 11,5 hours exercises

self-study: 116 hours

We regularly hand out exercise sheets. In addition, the course will be accompanied by practical exercises at the computer.

written examination: 90 minutes

Organizational issues

Die Termine für die Vorlesungen und für das Praktikum werden im ILIAS bekannt gegeben. Achtung: Der erste Termin für das Praktikum ist der 04.05.2023. und nicht der 20.04.2023.

Literature

1. Scientific Computing, G. Golub and J.M. Ortega (B.G.Teubner Stuttgart 1996)

T**11.76 Course: Normative Aspects of Technology Assessment - Limits and Possibilities of a (Prospective) Technology Assessment - Advanced Seminar [T-GEISTSOZ-111511]****Responsible:** Prof. Dr. Dr. Rafaela Hillerbrand**Organisation:** KIT Department of Humanities and Social Sciences**Part of:** [M-MACH-106583 - Key Competences](#)

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

Events					
WT 23/24	5000057	Aufbaumodul: Technikfolgenabschätzung und Normativität		Advanced seminar (Hillerbrand

T**11.77 Course: Optics and Solid State Electronics [T-ETIT-110275]**

Responsible: Prof. Dr. Ulrich Lemmer

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-105005 - Optics and Solid State Electronics

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

Events					
ST 2024	2304205	Optics and Solid State Electronics	3 SWS	Lecture /	Lemmer, Krewer
ST 2024	2304206	Optics and Solid State Electronics (Tutorial to 2304205)	2 SWS	Practice /	Lemmer, Krewer
ST 2024	2304207	Tutorien zu 2304205 Optik- und Festkörperelektronik	1 SWS	Tutorial (/	Lemmer, Krewer
Exams					
WT 23/24	7313719	Optics and Solid State Electronics			Lemmer, Krewer

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

Prerequisites

none

T**11.78 Course: Optoelectronic Components [T-ETIT-101907]**

Responsible: Prof. Dr. Wolfgang Freude

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-100509 - Optoelectronic Components

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

Events					
ST 2024	2309486	Optoelectronic Components	2 SWS	Lecture / ☀	Randel
ST 2024	2309487	Optoelectronic Components (Tutorial)	1 SWS	Practice / ☀	Randel
Exams					
WT 23/24	7309486	Optoelectronic Components			Freude
ST 2024	7309486	Optoelectronic Components			Randel

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

Prerequisites

none

T

11.79 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

11.80 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**11.81 Course: Photovoltaic System Design [T-ETIT-100724]****Responsible:** Dipl.-Ing. Robin Grab**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** M-ETIT-100411 - Photovoltaic System Design

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

Events					
ST 2024	2307380	Photovoltaische Systemtechnik	2 SWS	Lecture / 	Grab

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

none

T**11.82 Course: Physiology and Anatomy for Engineers I [T-ETIT-101932]**

Responsible: Prof. Dr. Werner Nahm

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-100390 - Physiology and Anatomy for Engineers I

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

Events					
WT 23/24	2305281	Physiology and Anatomy for Engineers I	2 SWS	Lecture / 	Nahm
Exams					
WT 23/24	7305281	Physiology and Anatomy for Engineers I			Nahm

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

Competence Certificate

Success control is carried out in the form of a written test of 60 minutes.

Prerequisites

none

T**11.83 Course: Power Generation [T-ETIT-101924]**

Responsible: Dr.-Ing. Bernd Hoferer

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-100407 - Power Generation

Type	Credits	Grading scale	Recurrence	Version
Oral examination	3	Grade to a third	Each winter term	2

Events					
WT 23/24	2307356	Power Generation	2 SWS	Lecture / 	Hoferer
Exams					
WT 23/24	7307356	Power Generation			Hoferer
ST 2024	7307356	Power Generation			Hoferer

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

Prerequisites

none

T**11.84 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**11.85 Course: Presentation [T-MACH-113254]**

Responsible: Prof. Dr.-Ing. Marcus Geimer
Organisation: KIT Department of Mechanical Engineering
Part of: [M-MACH-106579 - 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 the maximum processing time of the modul Bachelor Thesis but latest 6 weeks after the submission of the bachelor thesis.

The presentation should last around 20 minutes followed by a scientific discussion with the present expert audience. The students should show that they are able to independently present and discuss the content of their bachelor thesis according to scientific criteria.

Prerequisites

Bachelor Thesis has been started.

Modeled Conditions

The following conditions have to be fulfilled:

1. The course [T-MACH-113253 - Bachelor's Thesis](#) must have been started.

Annotation

No exam registration is required for the presentation. Passing will be registered by Examination Office.

T**11.86 Course: Product Lifecycle Management [T-MACH-105147]**

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

Part of: M-MACH-106195 - Product Lifecycle Management

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

Events					
WT 23/24	2121350	Product Lifecycle Management	2 SWS	Lecture /	Ovtcharova, Elstermann
Exams					
WT 23/24	76-T-MACH-105147	Product Lifecycle Management			Ovtcharova, Elstermann
ST 2024	76-T-MACH-105147	Product Lifecycle Management			Ovtcharova, Elstermann

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

Competence Certificate

Written examination 90 min.

Prerequisites

None

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

V**Product Lifecycle Management**

2121350, WS 23/24, 2 SWS, Language: German, [Open in study portal](#)

Lecture (V)
On-Site

Content

The course includes:

- Basics for product data management and data exchange
- IT system solutions for Product Lifecycle Management (PLM)
- Economic viability analysis and implementation problems
- Illustrative scenario for PLM using the example of the institute's own I4.0Lab

After successful attendance of the course, students can:

- identify the challenges of data management and exchange and describe solution concepts for these challenges.
- clarify the management concept PLM and its goals and highlight the economic benefits.
- explain the processes required to support the product life cycle and describe the most important business software systems (PDM, ERP, ...) and their functions.

Literature

Vorlesungsfolien.

- V. Arnold et al: Product Lifecycle Management beherrschen, Springer-Verlag, Heidelberg, 2005.
- J. Stark: Product Lifecycle Management, 21st Century Paradigm for Product Realisation, Springer-Verlag, London, 2006.
- A. W. Scheer et al: Prozessorientiertes Product Lifecycle Management, Springer-Verlag, Berlin, 2006.
- J. Schöttner: Produktdatenmanagement in der Fertigungsindustrie, Hanser-Verlag, München, 1999.
- M. Eigner, R. Stelzer: Produktdaten Management-Systeme, Springer-Verlag, Berlin, 2001.
- G. Hartmann: Product Lifecycle Management with SAP, Galileo press, 2007.
- K. Obermann: CAD/CAM/PLM-Handbuch, 2004.

T**11.87 Course: Programming [T-INFO-101531]**

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

Organisation: KIT Department of Informatics

Part of: [M-INFO-101174 - Programming](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	5	Grade to a third	Each winter term	1

Events					
WT 23/24	24004	Programming	4 SWS	Lecture / Practice (Heinrich
Exams					
WT 23/24	7500075	Programming			Koziolek, Heinrich

Modeled Conditions

The following conditions have to be fulfilled:

1. The course [T-INFO-101967 - Programming Pass](#) must have been passed.

T**11.88 Course: Programming Pass [T-INFO-101967]**

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

Organisation: KIT Department of Informatics

Part of: [M-INFO-101174 - Programming](#)

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

Events					
WT 23/24	24004	Programming	4 SWS	Lecture / Practice (Heinrich
Exams					
WT 23/24	7500074	Programming Pass			Koziolek, Heinrich

T**11.89 Course: Radiation Protection [T-ETIT-100825]**

Responsible: PD Dr. Bastian Breustedt
Prof. Dr. Werner Nahm

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-100562 - Radiation Protection](#)

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

Events					
ST 2024	2305272	Radiation Protection	2 SWS	Lecture / 	Breustedt
Exams					
WT 23/24	7305272	Radiation Protection			Breustedt
ST 2024	7305272	Radiation Protection			Breustedt

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

Competence Certificate

Success control is carried out as part of an overall written examination (2 h).

The module grade is the grade of the written exam.

Prerequisites

none

T**11.90 Course: Radio-Frequency Electronics [T-ETIT-110359]**

Responsible: Prof. Dr.-Ing. Ahmet Cagri Ulusoy
Organisation: KIT Department of Electrical Engineering and Information Technology
Part of: M-ETIT-105124 - Radio-Frequency Electronics

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

Events					
WT 23/24	2308503	Radio-Frequency Electronics	2 SWS	Lecture / 	Ulusoy
Exams					
WT 23/24	7308503	Radio-Frequency Electronics			Ulusoy

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

Competence Certificate

The success criteria will be determined by a written examination of 120 min.

Recommendation

Contents of the modules "Linear electrical networks" and "Electronic circuits".

T**11.91 Course: Robotics I - Introduction to Robotics [T-INFO-108014]**

Responsible: Prof. Dr.-Ing. Tamim Asfour
Organisation: KIT Department of Informatics
Part of: M-INFO-100893 - Robotics I - Introduction to Robotics

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

Events					
WT 23/24	2424152	Robotics I - Introduction to Robotics	3/1 SWS	Lecture / 	Asfour
Exams					
WT 23/24	7500106	Robotics I - Introduction to Robotics			Asfour
ST 2024	7500218	Robotik I - Einführung in die Robotik			Asfour

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

Competence Certificate

The assessment is carried out as a written examination (§ 4 Abs. 2 No. 1 SPO) lasting 60 minutes.

Prerequisites

none.

T**11.92 Course: Scientific Computing for Engineers [T-MACH-100532]**

Responsible: Prof. Dr. Peter Gumsch
Dr. Daniel Weygand

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-105369 - Scientific Computing for Engineers

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each winter term	3

Events					
WT 23/24	2181738	Scientific computing for Engineers	2 SWS	Lecture /	Weygand, Gumsch
WT 23/24	2181739	Exercises for Scientific Computing for Engineers	2 SWS	Practice /	Weygand
Exams					
WT 23/24	76-T-MACH-100532	Scientific Computing for Engineers			Weygand, Gumsch
ST 2024	76-T-MACH-100532	Scientific Computing for Engineers			Weygand, Gumsch

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

Competence Certificate

Written exam (90 minutes)

Prerequisites

The brick can not be combined with the brick "Application of advanced programming languages in mechanical engineering" (T-MACH-105390).

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

V**Scientific computing for Engineers**

2181738, WS 23/24, 2 SWS, Language: German, [Open in study portal](#)

**Lecture (V)
On-Site**

Content

1. Introduction: why scientific computing
2. computer architectures
3. Introduction to Unix/Linux
4. Foundations of C++
- * programm organization
- * data types, operator, control structures
- * dynamic memory allocation
- * functions
- * class
- * OpenMP parallelization
5. numeric /algorithms
- * finite differences
- * MD simulations: 2nd order differential equations
- * algorithms for particle simulations
- * solver for linear systems of eqns.

The student can

- apply the programming language C++ for scientific computing in the field of materials science
- adapt programs for use on parallel platforms
- choose suitable numerical methods for the solution of differential equations.

The lecture can not be combined with the lecture "Application of advanced programming languages in mechanical engineering" (2182735).

regular attendance: 22,5 hours

Lab: 22,5 hours (optional)

self-study: 75 hours

written exam 90 minutes

Literature

1. C++: Einführung und professionelle Programmierung; U. Breymann, Hanser Verlag München
2. C++ and object-oriented numeric computing for Scientists and Engineers, Daoqui Yang, Springer Verlag.
3. The C++ Programming Language, Bjarne Stroustrup, Addison-Wesley
4. Die C++ Standardbibliothek, S. Kuhlins und M. Schader, Springer Verlag

Numerik:

1. Numerical recipes in C++ / C / Fortran (90), Cambridge University Press
2. Numerische Mathematik, H.R. Schwarz, Teubner Stuttgart
3. Numerische Simulation in der Moleküldynamik, Griebel, Knapek, Zumbusch, Caglar, Springer Verlag

**Exercises for Scientific Computing for Engineers**

2181739, WS 23/24, 2 SWS, Language: German, [Open in study portal](#)

**Practice (Ü)
On-Site**

Content

Exercises for the different topics of the lecture "Scientific computing for Engineers" (2181738)

regular attendance: 22,5 hours

Organizational issues

Veranstaltungsort (RZ Pool Raum) wird in Vorlesung bekannt gegeben

Literature

Skript zur Vorlesung "Wissenschaftliches Programmieren für Ingenieure" (2181738)

T**11.93 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-106583 - 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 studies

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**11.94 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-106583 - 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**11.95 Course: Seminar Battery [T-ETIT-106051]**

Responsible: Dr.-Ing. Andre Weber

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-103037 - Seminar Battery](#)

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

Prerequisites

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

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

T**11.96 Course: Seminar Fuel Cell I [T-ETIT-110798]****Responsible:** Dr.-Ing. Andre Weber**Organisation:** KIT Department of Electrical Engineering and Information Technology**Part of:** M-ETIT-105320 - Seminar Fuel Cell I

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	3	Grade to a third	Each term	1 terms	1

Events					
WT 23/24	2304227	Seminar Fuel Cell	2 SWS	Seminar /  	Weber
ST 2024	2304227	Seminar Fuel Cell	2 SWS	Seminar /  	Weber
Exams					
WT 23/24	7300003	Seminar Fuel Cell I			Weber

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

Success control takes the form of other types of examination.

The grade consists of:

1. written report (50%)
2. seminar lecture (50%)

Prerequisites

none

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

V**Seminar Fuel Cell**2304227, WS 23/24, 2 SWS, Language: German/English, [Open in study portal](#)**Seminar (S)
On-Site****Content**

Seminar Fuel Cells (I + II for Bachelor and Master students respectively)

The fuel cell seminar is offered all year round (including the lecture-free period). In the seminar, topics related to current research work at the IAM-ET are discussed on a weekly basis. Participation in the seminar is possible for students from the Faculty of Electrical Engineering and Information Technology as well as for students from other faculties. The seminar paper is usually a theoretical work consisting of literature research and comparative evaluation of different approaches to solve a scientific or technical question. A seminar paper can be started at any time (just come along). The work includes a written thesis and a lecture to be given as part of the event. Regular attendance at the weekly appointments is not required. If possible, you should attend dates where other participants give their presentations. If you are interested in taking part in the seminar and writing a seminar paper, please contact the lecturer.

Organizational issuesAnmeldungen können unter: andre.weber@kit.edu erfolgen.**Literature**

werden zu Beginn der Seminararbeit themenspezifisch gegeben

V**Seminar Fuel Cell**2304227, SS 2024, 2 SWS, Language: German/English, [Open in study portal](#)**Seminar (S)
On-Site**

Content

Seminar Fuel Cells (I + II for Bachelor and Master students respectively)

The fuel cell seminar is offered all year round (including the lecture-free period). In the seminar, topics related to current research work at the IAM-ET are discussed on a weekly basis. Participation in the seminar is possible for students from the Faculty of Electrical Engineering and Information Technology as well as for students from other faculties. The seminar paper is usually a theoretical work consisting of literature research and comparative evaluation of different approaches to solve a scientific or technical question. A seminar paper can be started at any time (just come along). The work includes a written thesis and a lecture to be given as part of the event. Regular attendance at the weekly appointments is not required. If possible, you should attend dates where other participants give their presentations. If you are interested in taking part in the seminar and writing a seminar paper, please contact the lecturer.

Organizational issues

Anmeldungen können unter: andre.weber@kit.edu erfolgen.

Veranstaltung findet auch außerhalb der Vorlesungszeiten ganzjährig statt.

Literature

werden zu Beginn der Seminararbeit themenspezifisch gegeben

T

11.97 Course: Seminar on Selected Chapters of Biomedical Engineering [T-ETIT-100710]

Responsible: Dr.-Ing. Axel Loewe

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-100383 - Seminar on Selected Chapters of Biomedical Engineering

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each winter term	1

Events					
WT 23/24	2305254	Seminar on Selected Chapters of Biomedical Engineering	2 SWS	Seminar / 	Loewe
Exams					
WT 23/24	7305254	Seminar on Selected Chapters of Biomedical Engineering			Loewe

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

Competence Certificate

Success monitoring is carried out in the context of a lecture (approx. 25 minutes) followed by a discussion (approx. 10 minutes).

Prerequisites

none

T

11.98 Course: Seminar Power Electronics in Regenerative Energy Systems [T-ETIT-100714]

Responsible: Prof. Dr.-Ing. Marc Hiller

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-100397 - Seminar Power Electronics in Regenerative Energy Systems

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

Events					
ST 2024	2306318	Seminar Power Electronics in Regenerative Energy Systems	3 SWS	Seminar / 	Hiller
Exams					
ST 2024	7306318	Seminar Power Electronics in Regenerative Energy Systems			Hiller

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

Prerequisites

none

T**11.99 Course: Seminar: Fundamentals of Embedded Systems [T-ETIT-110832]**

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

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-105356 - Seminar: Fundamentals of Embedded Systems

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	4	Grade to a third	Each term	1 terms	3

Events					
WT 23/24	2311628	Seminar: Fundamentals of Embedded Systems	2 SWS	Seminar / 	Becker, Sax, Stork
ST 2024	2311628	Seminar Fundamentals of Embedded Systems	2 SWS	Seminar / 	Becker, Sax, Stork
Exams					
WT 23/24	7311628	Seminar: Fundamentals of Embedded Systems			Becker, Sax, Stork

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

Prerequisites

none

T**11.100 Course: Signals and Systems [T-ETIT-112860]**

Responsible: Dr.-Ing. Mathias Kluwe
Prof. Dr.-Ing. Sander Wahls

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-106372 - Signals and Systems](#)

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

Prerequisites

none

T**11.101 Course: Signals and Systems - Workshop [T-ETIT-112861]**

Responsible: Dr.-Ing. Mathias Kluwe
Prof. Dr.-Ing. Sander Wahls

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: [M-ETIT-106372 - Signals and Systems](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	2

Events

ST 2024	2302905	Signals and Systems - Workshop	1 SWS	Practical course / 	Wahls
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Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

Prerequisites

none

T**11.102 Course: Smart Factory [T-MACH-112972]**

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

Part of: [M-MACH-106671 - Production Technology](#)

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**11.103 Course: Software Engineering I [T-INFO-101968]**

Responsible: Prof. Dr.-Ing. Ina Schaefer
Organisation: KIT Department of Informatics
Part of: M-INFO-101175 - Software Engineering I

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

Events					
ST 2024	24518	Softwaretechnik I	4 SWS	Lecture / Practice (/)	Schaefer, Eichhorn
Exams					
WT 23/24	7500123	Software Engineering I			Schaefer
ST 2024	7500152	Software Engineering I			Schaefer

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

T**11.104 Course: Software Engineering I Pass [T-INFO-101995]**

Responsible: Prof. Dr.-Ing. Ina Schaefer
Organisation: KIT Department of Informatics
Part of: M-INFO-101175 - Software Engineering I

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

Events					
ST 2024	24518	Softwaretechnik I	4 SWS	Lecture / Practice (/)	Schaefer, Eichhorn
Exams					
ST 2024	7500250	Software Engineering I Pass			Schaefer

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

T**11.105 Course: Software Engineering II [T-INFO-101370]**

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

Organisation: KIT Department of Informatics

Part of: M-INFO-100833 - Software Engineering II

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

Events					
WT 23/24	24076	Software Engineering II	4 SWS	Lecture / 	Reussner
Exams					
WT 23/24	7500054	Software Engineering II			Reussner

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

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

V**Software Engineering II**

24076, WS 23/24, 4 SWS, Language: German, [Open in study portal](#)

Lecture (V)
On-Site

Literature

Craig Larman, Applying UML and Patterns, 3rd edition, Prentice Hall, 2004. Weitere Literaturhinweise werden in der Vorlesung gegeben.

T**11.106 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**11.107 Course: Superconducting Magnet Technology [T-ETIT-113440]**

Responsible: Prof. Dr. Tabea Arndt

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-106684 - Superconducting Magnet Technology

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

Events					
ST 2024	2312698	Superconducting Magnet Technology	3 SWS	Lecture / Practice (/ Blended (On-Site/Online))	Arndt

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

Competence Certificate

The examination takes place in form of an oral exam (abt. 30 minutes).

Two timeslots (weeks) for examination dates will be announced (usually near end of lecture period & end of semester).

The module grade is the grade of the oral exam.

Prerequisites

none

T**11.108 Course: Superconducting Power Systems [T-ETIT-113439]**

Responsible: Prof. Dr. Mathias Noe

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-106683 - Superconducting Power Systems

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

Events					
WT 23/24	2314011	Superconducting Power Systems	3 SWS	Lecture / Practice (/ 	Noe

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

Competence Certificate

The examination takes place in form of an oral exam (abt. 45 minutes).

The module grade is the grade of the oral exam.

Prerequisites

none

T**11.109 Course: Superconductors for Energy Applications [T-ETIT-110788]**

Responsible: apl. Prof. Dr. Francesco Grilli

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-105299 - Superconductors for Energy Applications

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	5	Grade to a third	Each winter term	1 terms	2

Events					
WT 23/24	2312704	Superconductors for Energy Applications	2 SWS	Lecture / 	Grilli
WT 23/24	2312705	Übungen zu 2312704 Superconductors for Energy Applications	1 SWS	Practice / 	Grilli
Exams					
WT 23/24	7300015	Superconductors for Energy Applications			Grilli

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

Competence Certificate

oral exam approx. 30 minutes.

Prerequisites

A basic knowledge of electromagnetism and thermodynamics is the only requirement. Previous knowledge of superconductivity is not necessary.

"T-ETIT-106970 - Superconducting Materials for Energy Applications" must not be taken.

T**11.110 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-106054 - Systematic Materials Selection

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

none

Recommendation

Basic knowledge in materials science, mechanics and mechanical design due to the lecture Materials Science I/II.

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

V**Systematic Materials Selection**

2174576, SS 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 developed. The following topics are covered:

- Information and introduction
- Necessary basics of materials
- Selected methods / approaches of the material selection
- Examples for material indices and materials property charts
- Trade-off and shape factors
- Sandwich materials and composite materials
- High temperature alloys
- Regard of process influences
- Material selection for production lines
- Incorrect material selection and the resulting consequences
- Abstract and possibility to ask questions

learning objectives:

The students are able to select the best material for a given application. They are proficient in selecting materials on base of performance indices and materials selection charts. They can identify conflicting objectives and find sound compromises. They are aware of the potential and the limits of hybrid material concepts (composites, bimaterials, foams) and can determine whether following such a concept yields a useful benefit.

requirements:

Wilng SPO 2007 (B.Sc.)

The course Material Science I [21760] has to be completed beforehand.

Wilng (M.Sc.)

The course Material Science I [21760] has to be completed beforehand.

workload:

The workload for the lecture is 120 h per semester and consists of the presence during the lecture (30 h) as well as preparation and rework time at home (30 h) and preparation time for the oral exam (60 h).

Literature

Vorlesungsskriptum; Übungsblätter; Lehrbuch: M.F. Ashby, A. Wanner (Hrsg.), C. Fleck (Hrsg.);

Materials Selection in Mechanical Design: Das Original mit Übersetzungshilfen

Easy-Reading-Ausgabe, 3. Aufl., Spektrum Akademischer Verlag, 2006

ISBN: 3-8274-1762-7

Lecture notes; Problem sheets; Textbook: M.F. Ashby, A. Wanner (Hrsg.), C. Fleck (Hrsg.);

Materials Selection in Mechanical Design: Das Original mit Übersetzungshilfen

Easy-Reading-Ausgabe, 3. Aufl., Spektrum Akademischer Verlag, 2006

ISBN: 3-8274-1762-7

T**11.111 Course: Systems Modeling [T-ETIT-112989]**

Responsible: Prof. Dr.-Ing. Mike Barth

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-106415 - Systems Modeling

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

Events					
WT 23/24	2311171	Systemmodellierung	1 SWS	Lecture / ☈	Barth
WT 23/24	2311172	Systemmodellierung Übung	1 SWS	Practice / 🎉	Dorn, Barth
Exams					
WT 23/24	7300049	Systems Modeling			Barth
ST 2024	7300020	Systems Modeling			Barth

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

Prerequisites

none

T**11.112 Course: Technical Thermodynamics and Heat Transfer I [T-MACH-104747]****Responsible:** Prof. Dr. Ulrich Maas**Organisation:** KIT Department of Mechanical Engineering**Part of:** M-MACH-102386 - Technical Thermodynamics and Heat Transfer I

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

Events					
WT 23/24	2165501	Technical Thermodynamics and Heat Transfer I	4 SWS	Lecture / 	Maas
WT 23/24	3165014	Technical Thermodynamics and Heat Transfer I	4 SWS	Lecture / 	Schießl, Maas
Exams					
WT 23/24	76-T-MACH-104747	Technical Thermodynamics and Heat Transfer I			Maas, Schießl
WT 23/24	76-T-MACH-104747-english	Technical Thermodynamics and Heat Transfer I			Maas, Schießl
ST 2024	76-T-MACH-104747	Technical Thermodynamics and Heat Transfer I			Maas, Schießl
ST 2024	76-T-MACH-104747-englisch	Technical Thermodynamics and Heat Transfer I			Maas, Schießl

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

Written exam, approx. 3 hours

Prerequisites

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

Modeled Conditions

The following conditions have to be fulfilled:

1. The course T-MACH-105204 - Excercises in Technical Thermodynamics and Heat Transfer I must have been passed.

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

V**Technical Thermodynamics and Heat Transfer I**2165501, WS 23/24, 4 SWS, Language: German, [Open in study portal](#)Lecture (V)
On-Site**Content**

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

Literature

Vorlesungsskriptum

Elsner, N.; Dittmann, A.: Energielehre und Stoffverhalten (Grundlagen der technischen Thermodynamik Bd. 1 und 2), 8. Aufl., Akademie-Verlag, 680 S. 1993.

Baehr, H.D.: Thermodynamik: eine Einführung in die Grundlagen und ihre technischen Anwendungen, 9. Aufl., Springer-Verlag, 460 S., 1996.

V**Technical Thermodynamics and Heat Transfer I**3165014, WS 23/24, 4 SWS, Language: English, [Open in study portal](#)Lecture (V)
On-Site**Content**

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

Literature

Vorlesungsskriptum

Elsner, N.; Dittmann, A.: Energielehre und Stoffverhalten (Grundlagen der technischen Thermodynamik Bd. 1 und 2), 8. Aufl., Akademie-Verlag, 680 S. 1993.

Baehr, H.D.: Thermodynamik: eine Einführung in die Grundlagen und ihre technischen Anwendungen, 9. Aufl., Springer-Verlag, 460 S., 1996.

T**11.113 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-106668 - Fluid Mechanics and Technical Thermodynamics and Heat Transfer I

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. 3 hours

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**11.114 Course: Technical Thermodynamics and Heat Transfer II [T-MACH-105287]****Responsible:** Prof. Dr. Ulrich Maas**Organisation:** KIT Department of Mechanical Engineering**Part of:** M-MACH-102830 - Technical Thermodynamics and Heat Transfer II

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

Events					
WT 23/24	2100020	Technical Thermodynamics and Heat Transfer II (Repeater Tutorial)	2 SWS	Tutorial (/)	Schießl
ST 2024	2166526	Technical Thermodynamics and Heat Transfer II	4 SWS	Lecture (/)	Maas
Exams					
WT 23/24	76-T-MACH-105287	Technical Thermodynamics and Heat Transfer II			Maas, Schießl
WT 23/24	76-T-MACH-105287-english	Technical Thermodynamics and Heat Transfer II			Maas, Schießl
ST 2024	76-T-MACH-105287	Technical Thermodynamics and Heat Transfer II			Maas, Schießl
ST 2024	76-T-MACH-105287-englisch	Technical Thermodynamics and Heat Transfer II			Maas, Schießl

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

Competence Certificate

Written exam, approx. 3 hours

Prerequisites

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

Modeled Conditions

The following conditions have to be fulfilled:

1. The course T-MACH-105288 - Exercises in Technical Thermodynamics and Heat Transfer II must have been passed.

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

V**Technical Thermodynamics and Heat Transfer II**2166526, SS 2024, 4 SWS, Language: German, [Open in study portal](#)Lecture (V)
On-Site**Content**

- Repetition of the topics of "Thermodynamics and Heat Transfer I"
- Behavior of mixtures
- Moist air
- 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 Transfer

Literature

Vorlesungsskriptum

Elsner, N.; Dittmann, A.: Energielehre und Stoffverhalten (Grundlagen der technischen Thermodynamik Bd. 1 und 2), 8. Aufl., Akademie-Verlag, 680 S. 1993.

Baehr, H.D.: Thermodynamik: eine Einführung in die Grundlagen und ihre technischen Anwendungen, 9. Aufl., Springer-Verlag, 460 S., 1996.

T**11.115 Course: Theory of Probability [T-ETIT-101952]**

Responsible: Dr.-Ing. Holger Jäkel

Organisation: KIT Department of Electrical Engineering and Information Technology

Part of: M-ETIT-102104 - Theory of Probability

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

Events					
WT 23/24	2310505	Theory of Probability	2 SWS	Lecture / ☀	Jäkel
WT 23/24	2310507	Tutorial for 2310505 Theory of Probability	1 SWS	Practice / ☀	Jäkel
Exams					
WT 23/24	7310505	Theory of Probability			Jäkel
ST 2024	7310505	Theory of Probability			Jäkel

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

Prerequisites

Contents of higher mathematics are necessary (e.g. M-MATH-101731 und M-MATH-101732).

T**11.116 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 assignments (pre-requisite). Exact requirements will be communicated in the lectures.

Prerequisites

None.

T**11.117 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 assignments (pre-requisite). Exact requirements will be communicated in the lectures.

Prerequisites

None.

T**11.118 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 assignments (pre-requisite). Exact requirements will be communicated in the lectures.

Prerequisites

None.

T**11.119 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**11.120 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**11.121 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**11.122 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-106668 - Fluid Mechanics and Technical Thermodynamics and Heat Transfer I](#)

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**11.123 Course: Wildcard Additional Examinations 1 [T-MACH-106638]****Organisation:** University**Part of:** [M-MACH-106439 - Further Examinations](#)

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

T**11.124 Course: Wildcard Additional Examinations 10 [T-MACH-106650]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106439 - Further Examinations](#)

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

T**11.125 Course: Wildcard Additional Examinations 2 [T-MACH-106639]****Organisation:** University**Part of:** [M-MACH-106439 - Further Examinations](#)

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

T**11.126 Course: Wildcard Additional Examinations 3 [T-MACH-106640]****Organisation:** University**Part of:** [M-MACH-106439 - Further Examinations](#)

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

T**11.127 Course: Wildcard Additional Examinations 4 [T-MACH-106641]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106439 - Further Examinations](#)

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

T**11.128 Course: Wildcard Additional Examinations 5 [T-MACH-106643]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106439 - Further Examinations](#)

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

T**11.129 Course: Wildcard Additional Examinations 6 [T-MACH-106646]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106439 - Further Examinations](#)

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

T**11.130 Course: Wildcard Additional Examinations 7 [T-MACH-106647]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106439 - Further Examinations](#)

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

T**11.131 Course: Wildcard Additional Examinations 8 [T-MACH-106648]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106439 - Further Examinations](#)

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

T**11.132 Course: Wildcard Additional Examinations 9 [T-MACH-106649]****Organisation:** KIT Department of Mechanical Engineering**Part of:** [M-MACH-106439 - Further Examinations](#)

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

T**11.133 Course: Workshop Mechatronical Systems and Products [T-MACH-108680]**

Responsible: Prof. Dr.-Ing. Sören Hohmann
Prof. Dr.-Ing. Sven Matthiesen

Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-106493 - Mechatronical Systems and Products

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

Events					
WT 23/24	2145162	Workshop Mechatronical Systems and Products	2 SWS	Practical course / 	Teltschik, Matthiesen, Hohmann
Exams					
WT 23/24	76-T-MACH-108680	Workshop Mechatronical Systems and Products			Hohmann, Matthiesen

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

Competence Certificate

Alongside the workshop, deliverables will be requested at defined milestones. In these, the application of the knowledge that has been developed within the framework of the module will be examined. These deliverables consist of CAD designs, control software and reflection reports, for example, are defined in a workshop assignment at the beginning of the semester. The milestones are announced in a calendar at the beginning of the semester and are available to students through ILIAS. The demanded deliveries are uploaded to ILIAS.

Prerequisites

none

Annotation

All relevant content (scripts, exercise sheets, etc.) for the course can be obtained via the eLearning platform ILIAS. To participate in the course, please complete the survey "Anmeldung und Gruppeneinteilung" in ILIAS before the start of the semester.