

**Studies Plan of the KIT Department of Mechanical Engineering
for the Master's Program
of Materials Science and Engineering (MatWerk)
Studies and Examination Regulations Version of 2017
(PO-Version 2017)**

The present English translation has no legally binding effect. It is provided for your information only.

Contents

| | | |
|------|---|----|
| 0. | List of Abbreviations | 2 |
| 1. | Studies Plans, Modules, and Examinations | 3 |
| 1.1. | Examinations | 3 |
| 1.2. | Modules in the Master's Program | 3 |
| 1.3. | Studies Plan of the Master's Program "M.Sc." | 5 |
| 1.4. | Options of Courses in the module Technical Specialization of the subject Interdisciplinary Supplement | 7 |
| 1.5. | Master's Thesis Module | 9 |
| 2. | Internship | 9 |
| 2.1. | Contents and Organization of the Internship | 9 |
| 2.2. | Recognition of the Internship | 10 |
| 3. | Focal Courses | 10 |
| 3.1. | Scope and Structure | 10 |
| 3.2. | Focal Courses (SP) and corresponding options | 11 |

History of Revisions (from 01.10.2020)

| Date | Revision made |
|------------|--|
| 15.03.2021 | Update of courses in the focal courses |
| 24.09.2021 | Update of courses in the focal courses |
| | |

0. List of Abbreviations

| | | |
|------------------|--------------|---|
| KIT Departments: | mach | KIT-Fakultät für Maschinenbau (KIT Department of Mechanical Engineering) |
| | inf | KIT-Fakultät für Informatik (KIT Department of Informatics) |
| | etit | KIT-Fakultät für Elektrotechnik und Informationstechnik (KIT Department of Electrical Engineering and Information Technology) |
| | chem | KIT-Fakultät für Chemie und Biowissenschaften (KIT Department of Chemistry and Biosciences) |
| | ciw | KIT-Fakultät für Chemieingenieurwesen und Verfahrenstechnik (KIT Department of Chemical and Process Engineering) |
| | phys wiwi | KIT-Fakultät für Physik (KIT Department of Physics) KIT-Fakultät für Wirtschaftswissenschaften (KIT Department of Economics and Management) |
| Semester: | WS | Winter semester |
| | SS | Summer semester |
| | ww | optional (offered in both the summer and winter semesters) |
| Language: | D | Deutsch (German) |
| | E | Englisch (English) |
| Achievements: | V | Vorlesung (lecture) |
| | Ü | Übung (exercise) |
| | P | Praktikum (internship) |
| | LP | Leistungspunkte (credits) |
| | mPr | mündliche Prüfung (oral examination) |
| | sPr | schriftliche Prüfung (written examination) |
| | PA | Prüfungsleistung anderer Art (examination of another type) |
| | SL | Studienleistung (coursework) |
| Others: | Gew | Gewichtung einer Prüfungsleistung im Modul bzw. in der Gesamtnote des Moduls (weighting of an examination result in the module or in the total grade of the module) |
| | B.Sc. | Studiengang Bachelor of Science (Bachelor of Science program) |
| | M.Sc. | Studiengang Master of Science (Master of Science program) |
| | MatWerk | Materialwissenschaft und Werkstofftechnik (Materials Science and Engineering) |
| | SPO | Studien- und Prüfungsordnung (studies and examination regulations) |
| | SWS | Semesterwochenstunden (weekly teaching hours) |
| | w p | wählbar (selectable) verpflichtend (mandatory) |

1. Studies Plans, Modules, and Examinations

The credits (Leistungspunkte, LP) are given according to the “European Credit Transfer and Accumulation System“ (ECTS).

1.1. Examinations

Every semester, at least one examination date must be offered for every examination. Examinations dates and times as well as dates on which students have to register for the examinations at the latest are specified by the examination committee. As a rule, registration for the examination takes place at least one week before the examination. Registration and examination dates are announced on the notice board in due time. Dates of written examinations are announced at the beginning of the lecture period, if possible.

The examiner decides on aids that may be used during an examination. The list of permitted aids must be announced together with the examination date.

The following rules apply to controls of success in the focus modules: In principle, examinations have to be carried out orally. If the examination expenditure is unacceptably high, an oral examination may be replaced by a written one. Oral examinations in focus subjects or partial modules of focuses must have a duration of 5 minutes per credit. If an oral examination is assigned more than 12 credits, the examination duration shall be 60 minutes.

Required coursework can be repeated several times.

1.2. Modules in the Master’s Program

Studies within the master’s program may be started in the winter or in the summer semester. Due to the options available (focuses, interdisciplinary complementary courses, transferable skills), no generally valid studies plan can be given. The options regarding the focuses are listed below. When calculating the total module grade, graded controls of success are considered with the weights indicated (Gew).

The subject of “Überfachliche Qualifikationen“ (transferable skills) described in Articles 15 a and 19, par. 2 of the Studies and Examination Regulations covers of the “Schlüsselqualifikationen“ (key competences) module, within which courses offered by the KIT House of Competence (HoC), KIT-Sprachenzentrum (SPZ, Language Center), and the Zentrum für Angewandte Kulturwissenschaft und Studium Generale (ZAK, Center for Cultural and General Studies) and controls of success in the total amount of 4 credits can be selected freely. At the student’s request, the examination committee can permit other, freely selectable controls of success in the module “Schlüsselqualifikationen“ (key competences).

The following modules are part of the master’s program:

| Modules | Partial Achievement | Coordinator | Credits | Controls of Success | Gew |
|----------------------------------|--|-------------|---------|---------------------|-----|
| 1 Thermodynamik (Thermodynamics) | Thermodynamische Grundlagen / Heterogene Gleichgewichte Fundamentals in Materials Thermodynamics and Heterogeneous Equilibria | Seifert | 6 | SL, mPr | 6 |
| 2 Kinetik (Kinetics) | Festkörperreaktionen / Kinetik von Phasenumwandlungen, | Seifert | 6 | SL, mPr | 6 |

| Modules | Partial Achievement | Coordinator | Credits | Controls of Success | Gew |
|--|---|--------------|---------|---------------------|-----|
| | Korrosion Solid-state Reactions and Kinetics of Phase Transformations, Corrosion | | | | |
| 3 Simulation (Simulation) | Angewandte Werkstoffsimulation Applied Materials Simulation | Gumbsch | 6 | SL, mPr | 6 |
| 4 Eigenschaften (Properties) | Gefüge-Eigenschafts-Beziehungen Microstructure-Property Relationships | Kirchlechner | 6 | SL, mPr | 6 |
| 5 Werkstoffanalytik (Materials characterization) | Werkstoffanalytik Materials Characterization | Pundt | 6 | SL, mPr | 6 |
| 6 Schwerpunkt I (Focal Course I) | Cf. section 3 | | 16 | mPr | 16 |
| 7 Schwerpunkt II (Focus Course II) | Cf. section 3 | | 16 | mPr | 16 |
| 8 Technische Vertiefung (Technical Specialisation) | See 1.4 | | 12 | m/sPr | 12 |
| 9 Schlüsselqualifikationen (Key competences) | HoC/SPZ/ZAK courses | | 4 | SL* | 0 |

In modules 1-5, all partial achievements are offered in both English and German.

In modules 6-9, students may choose from English or German partial achievements up to the total amount of credits of the module.

* The subject of "Überfachliche Qualifikationen" (Interdisciplinary Qualifications) and the module of "Schlüsselqualifikationen" (Key competences) are not graded. Graded controls of success in the Schlüsselqualifikationen (Key competences) are listed in the transcript of records, but not considered when calculating the total grade.

In addition, an internship of 9 weeks' duration has to be passed (12 credits).

After the module examinations, a master's thesis of 6 months' duration (30 credits) has to be written and presented.

1.3. Studies Plan of the Master's Program "M.Sc."

Plan of studies in German throughout:

| Semester | WS 1 | SS 2 | WS 3 | SS 4 | Total 120 LP |
|----------------------------------|---|--|--|--------------------|-----------------|
| Subject | 32 LP | 30 LP | 28 LP | 30 LP | |
| Materialwiss. Vertiefung | Thermodynamische Grundlagen / Heterogene Gleichgewichte 6 LP, mPr Festkörperreaktionen / Kinetik von Phasenumwandlungen, Korrosion 6 LP, mPr | Angewandte Werkstoffsimulation 6 LP, mPr Gefüge- Eigenschafts- Beziehungen 6 LP, mPr Werkstoffanalytik 6 LP, mPr | | Masterarbeit 30 LP | 30 LP |
| Schwerpunkt I * | Siehe 3.2 8 LP, 2 mPr | Siehe 3.2 8 LP, 2 mPr | | | 16 LP |
| Schwerpunkt II * | | | Siehe 3.2 16 LP, 3 mPr | | 16 LP |
| Interdisziplinäre Ergänzung | | Siehe 1.4 4 LP, m/sPr | Siehe 1.4 8 LP, m/sPr | | 12 LP |
| Überfachliche Qualifikationen | | | HoC/SPZ/ZAK- Veranst. 4 LP, SL | | 4 LP |
| | Berufspraktikum 12 LP | | | | 12 LP |

* Selection of two from four possible focal courses according to Section 3. The precise amount of credits per semester depends on the courses chosen.

Plan of studies in English throughout:

| Semester | WS 1 | SS 2 | WS 3 | SS 4 | Total 120 credits |
|---|---|---|--|----------------------------|-------------------------|
| Subject | 32 credits | 30 credits | 28 credits | 30 credits | |
| Materialwiss. Vertiefung (Materials Science Major Course) | Microstructure- Property Relationships 6 credits, mPr Materials Characterization 6 credits, mPr | Applied Materials Modeling 6 credits, mPr Fundamentals in Materials Thermodynamics and Heterogeneous Equilibria 6 credits, mPr Solid-state Reactions and Kinetics of Phase Transformations, Corrosion 6 credits, mPr | | Master's thesis 30 credits | 30 credits |
| Schwerpunkt I * (Focal Course I) | See 3.2 8 credits, 2 mPr | See 3.2 8 credits, 2 mPr | | | 16 credits |
| Schwerpunkt II * (Focal Course II) | | | See 3.2 16 credits, 3 mPr | | 16 credits |
| Interdisziplinäre Ergänzung (Interdisciplinary Supplement) | | See 1.4 4 credits, m/sPr | See 1.4 8 credits, m/sPr | | 12 credits |
| Überfachliche Qualifikationen (Interdisciplinary Qualifications) | | | HoC/SPZ/ZAK- courses 4 credits, SL | | 4 credits |
| | Internship 12 credits | | | | 12 credits |
| | | | | | |

* Selection of two from four possible focal courses according to Section 3. The precise amount of credits per semester depends on the courses chosen.

1.4. Options of Courses in the module Technical Specialization of the subject Interdisciplinary Supplement

| Course number | Course | Lecturer | SWS | Credits | Control of success | Sem | Language |
|---------------------|---|-------------------------|-----|---------|--------------------|-------|----------|
| 2306321+ 2306323 | Hybride und elektrische Fahrzeuge | Doppelbauer, Richter | 3 | 4 | sPr | WS | D |
| 2147175 | CAE-Workshop | Albers | 3 | 4 | sPr | WS/SS | D |
| 2146180 | Antriebssystemtechnik A: Fahrzeugantriebstechnik | Albers | 2 | 4 | sPr | SS | D |
| 2145150 | Antriebssystemtechnik B: Stationäre Antriebssysteme | Albers | 2 | 4 | sPr | WS | D |
| 2117500 | Energieeffiziente Intralogistiksysteme | Schönung | 2 | 4 | mPr | WS | D |
| 2145181 | Angewandte Tribologie in der industriellen Produktentwicklung | Albers | 2 | 4 | mPr | WS | D |
| 2181114 | Tribologie | Scherge/ Dienwiebel | 5 | 8 | mPr | WS | D |
| 2113805 | Grundlagen der Fahrzeugtechnik I* | Gauterin | 4 | 8 | sPr | WS | D |
| 2113809 | Automotive Engineering I* | Gauterin/ Gießler | 4 | 8 | sPr | WS | E |
| 2113812 | Grundsätze der Nutzfahrzeugentwicklung I | Zürn | 1 | 2 | mPr | WS | D |
| 2114844 | Grundsätze der Nutzfahrzeugentwicklung II | Zürn | 1 | 2 | mPr | SS | D |
| 2149670 | Produkt- und Produktionskonzepte für moderne Automobile | Steegmüller, Kienzle | 2 | 4 | mPr | WS | D |
| 2123364 | Produkt-, Prozess- und Ressourcenintegration in der Fahrzeugentwicklung | Mbang | 2 | 4 | sPr | SS | D |
| 2133113 | Verbrennungsmotoren I | Kubach | 2 | 4 | mPr | WS | D |
| 2134151 | Verbrennungsmotoren II | Kubach | 3 | 5 | mPr | SS | D |
| 2150904 | Automatisierte Produktionsanlagen | Fleischer | 6 | 8 | mPr | SS | D |
| 2133109 | Betriebsstoffe für motorische Antriebe | Kehrwald | 2 | 4 | mPr | WS | D |
| 2189906 | Physikalische und chemische Grundlagen der Kernenergie im Hinblick auf Reaktorstörfälle und nukleare Entsorgung | Dagan, Metz | 1 | 2 | mPr | WS | D |
| 2169472 | Thermische Solarenergie | Stieglitz | 2 | 4 | mPr | WS | D |
| 2157381 | Windkraft | Lewald | 2 | 4 | sPr | WS | D |
| 2165515+ 2165517 | Grundlagen der technischen Verbrennung I* | Maas | 3 | 4 | mPr | WS | D |
| 3165016+ 3165017 | Fundamentals of Combustion I* | Maas | 3 | 4 | mPr | WS | E |
| 2166538+ 2166589 | Grundlagen der technischen Verbrennung II | Maas | 3 | 4 | mPr | SS | D |
| 2170478 | Turbinen-Luftstrahl-Triebwerke | Bauer | 2 | 4 | mPr | SS | D |
| 2424152 | Robotik I – Einführung in die Robotik | Asfour | 4 | 6 | sPr | WS | D |
| 2109035 | Arbeitswissenschaft I: Ergonomie | Deml | 2 | 4 | sPr | WS | D |
| 2109036 | Arbeitswissenschaft II: | Deml | 2 | 4 | sPr | WS | D |

| | | | | | | | |
|-------------------------|---|----------------|---|----|-----|-------|-----|
| | Arbeitsorganisation | | | | | | |
| 2149667 | Qualitätsmanagement | Lanza | 2 | 4 | sPr | WS | D |
| 2115919 | Bahnsystemtechnik | Gratzfeld | 2 | 4 | mPr | WS/SS | D |
| 2115996 | Schienenfahrzeugtechnik | Gratzfeld | 2 | 4 | mPr | WS/SS | D |
| 2133132 | Alternative Antriebe für Automobile | Noreikat | 2 | 4 | sPr | WS | D |
| 2106014 | Datenanalyse für Ingenieure | Mikut, Reischl | 3 | 5 | sPr | SS | D |
| 2169453+ 2169454 | Thermische Turbomaschinen I* | Bauer | 5 | 6 | mPr | WS | D |
| 2169553+ 2169454 | Thermische Turbomaschinen I (auf Englisch) * | Bauer | 5 | 6 | mPr | WS | E |
| 2170476+ 2170477 | Thermische Turbomaschinen II* | Bauer | 3 | 6 | mPr | SS | D |
| 2170553+ 2170477 | Thermische Turbomaschinen II (auf Englisch) * | Bauer | 5 | 6 | mPr | SS | E |
| 2121350 | Product Lifecycle Management | Ovtcharova | 2 | 4 | sPr | WS | D |
| 2121001 | Technische Informationssysteme | Ovtcharova | 3 | 5 | mPr | SS | D |
| 2161212+ 2161213 | Technische Schwingungslehre | Fidlin | 4 | 5 | sPr | WS | D |
| 2146190 | Konstruktiver Leichtbau | Albers | 2 | 4 | mPr | SS | D |
| 2143882 | Fertigungsprozesse der Mikrosystem-technik | Bade | 2 | 4 | mPr | WS/SS | D |
| 2141864 | BioMEMS-Mikrosystemtechnik für Life-Sciences und Medizin: I | Guber | 2 | 4 | mPr | WS | D |
| 2142883 | BioMEMS-Mikrosystemtechnik für Life-Sciences und Medizin: II | Guber | 2 | 4 | mPr | SS | D |
| 2142879 | BioMEMS-Mikrosystemtechnik für Life-Sciences und Medizin: III | Guber | 2 | 4 | mPr | SS | D |
| 2125763 | Struktur- und Phasenanalyse | Wagner | 2 | 4 | mPr | WS | D |
| 4027111+ 4027021 | Elektronenmikroskopie I+II (mit Übungen) | Gerthsen | 8 | 16 | mPr | SS/WS | D |
| 2142140 | Bionik für Ingenieure und Naturwissenschaftler | Hölscher | 2 | 4 | mPr | SS | D |
| 2313760 | Fabrication and Characterisation of Optoelectronic Devices | Richards | 2 | 3 | sPr | SS | E |
| 4044021+ 4044022 | Fundamentals of Optics and Photonics | Hunger | 6 | 8 | sPr | WS | E |
| 7148 | Basic Molecular Cell Biology | Weth | 2 | 2 | sPr | SS | E |
| 3137020 + 3137021 | Measurement and Control Systems | Stiller | 4 | 6 | sPr | WS | E |
| 2141853 | Polymers in MEMS A - Chemistry, Synthesis and Applications | Rapp | 2 | 4 | mPr | WS | D/E |
| 2141854 | Polymers in MEMS B - Physics, Manufacturing and Applications | Worgull | 2 | 4 | mPr | WS | D/E |
| 2142855 | Polymers in MEMS C - Biopolymers and Bioplastics | Worgull | 2 | 4 | mPr | SS | D/E |

- * The following courses cannot be combined:
 - Grundlagen der Fahrzeugtechnik I and Automotive Engineering I
 - Grundlagen der technischen Verbrennung I and Fundamentals of Combustion I
 - Thermische Turbomaschinen I and Thermische Turbomaschinen I (auf Englisch)
 - Thermische Turbomaschinen II and Thermische Turbomaschinen II (auf Englisch)

1.5. Master's Thesis Module

The master's thesis module consists of a master's thesis and a presentation of the background and scientific contents of the master's thesis. The presentation is to have a duration of 30 minutes, followed by a scientific discussion with the responsible supervisors and the public. The presentation and discussion will be considered when determining the total grade of the master's thesis module. Registration for the master's thesis has to take place via the Students Portal (Campus Management).

2. Internship

2.1. Contents and Organization of the Internship

Within the master's program, an internship must be passed according to SPO Article 14a. The internship is to provide insights into and experience in engineering work. The internship must have a minimum duration of 9 weeks. In any case, lost working time must be compensated. In case of lost working time, the intern should ask the company for an extension of the contract for him/her to be able to continue the internship as required.

The Internship Office (Praktikantenamt) does not find and offer internship places. The students themselves have to contact a company and ask for an internship place. The internship relationship becomes legally binding by the conclusion of a training contract (Ausbildungsvertrag) between the company and the intern. This contract defines all rights and obligations of the intern and the training company as well as the type and duration of the internship. In this connection, company is to be understood as a synonym of engineering offices, enterprises, authorities, etc. It is not permitted to pass an internship at an institution of KIT.

To ensure a sufficient scope of practical training, the intern must work in at least two different areas.

It may be chosen among the following areas:

- Werkstoffentwicklung (materials development)
- Werkstoffprüfung / Qualitätskontrolle (materials testing / quality control)
- Materialsynthese (materials synthesis)
- Werkstoffauswahl im Produktentstehungsprozess (materials selection in the product development process)
- Metallurgie / Pulvermetallurgie (metallurgy / powder metallurgy)
- Urformtechnik (molding)
- Umformtechnik (forming)
- Oberflächentechnik (surface treatment)
- Wärmebehandlung (thermal treatment)
- andere werkstofftechnische Tätigkeitsgebiete (nach Rücksprache mit dem Praktikantenamt der KIT-Fakultät für Maschinenbau) (other areas of materials engineering (upon agreement with the Internship Office of the KIT Department of Mechanical Engineering)).

2.2. Recognition of the Internship

For recognition of the internship, the original training contract and the original proof of activity have to be submitted. The types and durations of the individual activities must be clearly obvious from the documents. For recognition of the internship, an internship certificate (Praktikantenzugnis) issued by the training company is required, which describes the types and durations of the activities during the internship. Days of absence have to be indicated. In addition, recognition of the internship requires the chairperson of the examination committee or an examiner according to Article 17, par. 2, SPO to confirm completion of the internship by a report and short presentation.

Students having acquired the university entrance qualification in Germany (Bildungsinländer) are strongly recommended to pass the complete or part of the internship abroad. Internships at foreign companies will only be recognized, however, if they comply with the above regulations.

3. Focal Courses

3.1. Scope and Structure

In the master's program, two different Schwerpunkte (focuses) have to be chosen, in which at least 16 credits each are acquired. The amount of 16 credits may be exceeded once only by registration of a partial achievement. It is not permitted to register additional partial achievements, if 16 credits have already been exceeded. Within a focus, at least 12 credits must be acquired by graded controls of success and at least 8 credits must be chosen from courses marked by "X". The focus grade is calculated from the completed graded partial modules.

In any case, all partial module grades are weighed according to their credits when determining the focus grade. When calculating the total grade, every focus is evaluated with 16 credits.

The combinations chosen from the selectable controls of success / partial achievements of the different focuses given below must be presented to the examination committee for approval. Deviating combinations may be permitted, but require the prior approval by the focus coordinators. The template to be used for the approval of focuses is given at the end of this studies plan. The courses listed with English titles in the course catalogs are held in English.

3.2. Focal Courses (SP) and corresponding options

SP1: Konstruktionswerkstoffe (Structural Materials)

Coordinator: Professor Heilmaier

| Course number | | Course | Lecturer | SWS | Credits | Control of success | Sem | Language |
|---------------|---|--|-----------------------|-----|---------|--------------------|-----|----------|
| 2114053 | X | Faserverstärkte Kunststoffe - Polymere, Fasern, Halbzeuge, Verarbeitung | Henning | 2 | 4 | mPr | SS | D |
| 2125751 | | Praktikum "Technische Keramik" | Schell | 2 | 4 | SL | WS | D |
| 2126749 | X | Pulvermetallurgische Hochleistungswerkstoffe | Schell | 2 | 4 | mPr | SS | D |
| 2126775 | X | Strukturkeramiken | Hoffmann | 2 | 4 | mPr | SS | D |
| 2173580 | | Mechanik und Festigkeitslehre von Kunststoffen | von Bernstorff | 2 | 4 | mPr | WS | D |
| 2173585 | X | Schwingfestigkeit metallischer Werkstoffe | Guth | 2 | 4 | mPr | WS | D |
| 2174571 | | Konstruieren mit Polymerwerkstoffen | Liedel | 2 | 4 | mPr | SS | D |
| 2174574 | X | Werkstoffe für den Leichtbau | Liebig | 2 | 4 | mPr | SS | D |
| 2174579 | X | Technologie der Stahlbauteile | Schulze | 2 | 4 | mPr | SS | D |
| 2175590 | | Experimentelles metallographisches Praktikum | Mühl | 3 | 4 | SL | ww | D |
| 2177618 | X | Superharte Dünnschichtmaterialien* | Ulrich | 2 | 4 | mPr | WS | D |
| 2194729 | X | Superhard Thin Film Materials* | Ulrich | 2 | 4 | mPr | SS | E |
| 2194643 | X | Aufbau und Eigenschaften verschleißfester Werkstoffe* | Ulrich | 2 | 4 | mPr | SS | D |
| 2181712 | X | Nanotribologie und -mechanik | Dienwiebel / Hölscher | 2 | 4 | mPr | ww | D/E |
| 2181745 | | Auslegung hochbelasteter Bauteile | Aktaa | 2 | 4 | mPr | WS | D |
| 2194724 | X | Werkstoffeinsatz bei hohen Temperaturen | Gorr | 2 | 4 | mPr | SS | D |
| 2193050 | X | Hochtemperaturkorrosion | Gorr | 2 | 4 | mPr | WS | D |
| 2113102 | | Fahrzeugleichtbau – Strategien, Konzepte, Werkstoffe | Henning | 2 | 4 | mPr | WS | D |
| 2181750 | | Plastizität auf verschiedenen Skalen | Schulz/Greiner | 2 | 4 | mPr | WS | D |
| 2182572 | X | Schadenskunde | Schneider/Greiner | 2 | 4 | mPr | WS | D |
| 2181708 | | Biomechanik: Design in der Natur und nach der Natur | Matheck | 2 | 4 | SL | WS | D |
| 2173583 | X | Hydrogen in Materials: from Energy Storage to Hydrogen Embrittlement | Pundt | 2 | 4 | mPr | WS | E |
| 2174572 | X | Wasserstoff in Materialien: von der Energiespeicherung zur Materialversprödung | Pundt | 2 | 4 | mPr | SS | D |
| 2173600 | X | Werkstoffe in der additiven Fertigung | Dietrich | 2 | 4 | mPr | WS | D |
| 2173648 | X | Plasticity of Metals and Intermetallics | Kauffmann | 4 | 8 | mPr | SS | E |
| 2174605 | X | High Temperature Materials | Heilmaier | 2 | 4 | mPr | WS | E |
| 2178123 | X | Thin Film and Small Scale Mechanical Behavior | Gruber/Weygand | 2 | 4 | mPr | SS | E |
| 2194660 | X | Advanced Materials Thermodynamics: Experiments and Modelling | Seifert/Franke | 2 | 4 | mPr | SS | D/E |
| 2193051 | X | Thermophysics of Advanced Materials | Sergeev | 2 | 4 | mPr | WS | E |
| 2173421 | X | Phase Transformations in Materials | Heilmaier/Kauffmann | 2 | 4 | mPr | WS | E |

- * Only one of the three controls of success / partial achievements “Superharte Dünnschichtmaterialien“, “Superhard Thin Film Materials” and “Aufbau und Eigenschaften verschleißfester Werkstoffe“ may be completed within the focal course SP1.

| Course number | | Course | Lecturer | SWS | Credits | Control of success | Sem | Language |
|----------------------|---|--|----------------------------|-----|---------|--------------------|-------|----------|
| 2183717 | X | Seminar "Werkstoffsimulation" (Pflicht) | Gumbsch / Nestler / Böhlke | 4 | 8 | PA | WS/SS | D/E |
| 2181740+ 2181741 | X | Atomistische Simulation und Molekulardynamik | Gumbsch | 2 | 4 | mPr | SS | E |
| 2183702 | X | Mikrostruktursimulation | Nestler / Weygand / August | 3 | 4 | mPr | WS | D |
| 2183721 | X | High Performance Computing | Nestler / Selzer | 2 | 4 | sPr | WS/SS | D |
| 2162282+ 2162257 | X | Einführung in die Finite-Elemente-Methode | Böhlke / Langhoff | 3 | 6 | sPr | SS | D |
| 2161250+ 2161147 | X | Rechnerunterstützte Mechanik I | Böhlke / Langhoff | 4 | 6 | mPr | WS | D |
| 2162296+ 2162297 | X | Rechnerunterstützte Mechanik II | Böhlke / Langhoff | 4 | 6 | mPr | SS | D |
| 2182732 | X | Einführung in die Materialtheorie | Kamlah | 2 | 4 | mPr | SS | D |
| 2181720 | X | Grundlagen der nichtlinearen Kontinuumsmechanik | Kamlah | 2 | 4 | mPr | WS | D |
| 2181738 | X | Wissenschaftliches Programmieren für Ingenieure | Weygand / Gumbsch | 2 | 4 | mPr | WS | D |
| 2182740 | X | Werkstoffmodellierung: Versetzungsbasierte Plastizität | Weygand | 2 | 4 | mPr | SS | D |
| 6215903 / 6215904 | X | Bruch- und Schädigungsmechanik | Seelig | 4 | 6 | mPr | SS | D |
| 2181745 | X | Auslegung hochbelasteter Bauteile | Aktaa | 2 | 4 | mPr | WS | D |
| 2194658 | X | Application of Density Functional Methods to Materials Modelling | Vladimirov | 3 | 4 | mPr | SS | E |
| 2162280 +2162281 | X | Mathematische Methoden der Mikromechanik | Böhlke | 3 | 6 | sPr | SS | D |
| 2162344 | X | Nonlinear Continuum Mechanics | Böhlke | 3 | 4 | mPr | SS | E |
| 2305263+ 2305265 | X | Electromagnetics and Numerical Calculation of Fields | Dössel | 3 | 4 | sPr | WS | E |
| 4023141+ 4023142 | X | Simulation nanoskaliger Systeme | Wenzel | 3 | 6 | mPr | SS | D |
| 4023021+ 4023022 | | Computational Photonics | Rockstuhl | 4 | 6 | mPr | WS | E |
| 4023151+ 4023152 | | The ABC of DFT | Wenzel | 3 | 6 | mPr | SS | E |
| 4023161+ 4023162 | | Computational Condensed Matter Physics | Wenzel | 6 | 12 | mPr | SS | E |
| 2142875 | | Mikrosystem Simulation | Korvink | 3 | 4 | sPr | SS | E |

Passing of the partial achievement "Seminar Werkstoffsimulation" (can be taken in German or English) is mandatory in focal course SP2. The remaining credits may be chosen from the list of other controls of success / partial achievements.

| Course number | | Course | Lecturer | SWS | Credits | Control of success | Sem | Language |
|------------------|---|---|---------------------|-----|---------|--------------------|-------|----------|
| 2149657 | X | Fertigungstechnik | Schulze | 6 | 8 | sPr | WS | D |
| 2174575 | | Gießereikunde | Wilhelm | 2 | 4 | mPr | SS | D |
| 2173571 | | Schweißtechnik | Farajian | 2 | 4 | mPr | WS | D |
| 2173590 | X | Polymerengineering I | Elsner | 2 | 4 | mPr | WS | D |
| 2174596 | X | Polymerengineering II | Elsner | 2 | 4 | mPr | SS | D |
| 2193010 | X | Grundlagen der Herstellungsverfahren der Keramik und Pulvermetallurgie | Schell | 2 | 4 | mPr | WS | D |
| 2126730 | X | „Keramische Prozessstechnik“ | Binder | 2 | 4 | mPr | SS | D |
| 22948 /22990 | | Materialien für elektrochemische Speicher und Wandler | Tübke | 2 | 4 | mPr | WS/SS | D |
| 2177601 | X | Aufbau und Eigenschaften von Schutzschichten | Ulrich | 2 | 4 | mPr | WS | D |
| 2178642 | X | Lasereinsatz im Automobilbau | Schneider | 2 | 4 | mPr | SS | D |
| 2150681 | | Umformtechnik | Herlan | 2 | 4 | mPr | SS | D |
| 2173560 | | Experimentelles schweißtechnisches Praktikum, in Gruppen | Schulze / Dietrich | 3 | 4 | SL | WS | D |
| 2173520 | X | Werkstoffrecycling und Nachhaltigkeit | Liebig | 2 | 4 | mPr | WS | D |
| 2113110 | X | Leichtbau mit Faser-Verbund-Kunststoffen – Theorie und Praxis | Kärger/ Liebig | 2 | 4 | mPr | WS | D |
| 2114107 | X | Simulation der Prozesskette kontinuierlich verstärkter Faserverbundbauteile | Kärger | 2 | 4 | mPr | SS | D |
| 2149680 | | Projekt Mikrofertigung: Entwicklung und Fertigung eines Mikrosystems | Schulze / Matuschka | 3 | 5 | mPr | WS | D |
| 2150550 | | Praktikum Produktionsintegrierte Messtechnik | Lanza | 3 | 4 | PA | SS | D |
| 2141861 | X | Grundlagen der Mikrosystemtechnik I | Korvink | 2 | 4 | m/s Pr | WS | E |
| 2142874 | X | Grundlagen der Mikrosystemtechnik II | Korvink | 2 | 4 | m/s Pr | SS | E |
| 2301478 | X | Laser Metrology | Eichhorn | 2 | 3 | mPr | SS | E |
| 2141501 | X | Mikro NMR Technologie | Korvink | 2 | 4 | PA | WS | E |
| 2311629+ 2311631 | X | Optical Engineering | Stork | 3 | 4 | mPr | WS | E |

| Course number | | Course | Lecturer | SWS | Credits | Control of success | Sem | Language |
|---------------------|---|--|----------------------------------|-----|---------|--------------------|-----------|----------|
| 2304207+ 2304213 | X | Batterien und Brennstoffzellen* | Weber | 3 | 5 | mPr | WS | D |
| 2304231 | X | Sensoren | Menesklou | 2 | 3 | sPr | WS | D |
| 2304240 | X | Sensorsysteme | Wersing | 2 | 3 | mPr | SS | D |
| 2313737 | X | Photovoltaik** | Powalla | 4 | 6 | sPr | SS | D |
| 2313726+ 2313728 | X | Optoelektronik | Lemmer | 3 | 4 | mPr | SS | D |
| 2313734 | | Grundlagen der Plasmatechnologie | Kling | 2 | 4 | mPr | SS | D |
| 2141865 | X | Neue Aktoren und Sensoren | Kohl / Sommer | 2 | 4 | mPr | WS | D |
| 2141866 | | Aktoren und Sensoren in der Nanotechnik | Kohl | 2 | 4 | mPr | WS | D |
| 4021011 | X | Elektronische Eigenschaften von Festkörpern I | Weber / Weiß | 4 | 8 | mPr | WS | D |
| 4021111 | | Elektronische Eigenschaften von Festkörpern II | Ustinov | 2 | 4 | mPr | SS | D |
| 5404 | | Spektroskopie mit Elektronen und weichen Röntgenstrahlen | Heske / Weinhart | 2 | 4 | mPr | SS | D |
| 5439 | | Moderne Charakterisierungsmethoden zur Charakterisierung von Materialien und Katalysatoren | Grunwaldt / Kleist / Lichtenberg | 2 | 4 | mPr | WS | D |
| 23660 | X | VLSI-Technologie | Siegel | 2 | 4 | mPr | WS | D |
| 2309456+ 2309457 | X | Halbleiterbauelemente | Koos | 3 | 5 | sPr | WS | D |
| 2126784 | | Funktionskeramiken | Hinterstein | 2 | 4 | mPr | WS | D |
| 2181710 | X | Mechanik von Mikrosystemen | Gruber / Greiner | 2 | 4 | mPr | WS | D |
| 2312717 + neu | X | Superconducting Materials*** | Holzapfel | 4 | 6 | mPr | WS/ SS | E |
| 2312708 +2312709 | X | Superconductivity for Engineers*** | Holzapfel/ Kempf | 3 | 5 | sPr | WS/ SS | E |
| 2314011 + neu | X | Superconducting Magnet Technology and Power Systems*** | Arndt/Noe | 6 | 7 | mPr | WS/ SS | E |
| 2193009 | X | Thermochemie von Angewandten Materialien | Seifert | 2 | 4 | mPr | WS | D |
| 2193013 | | Lasergestützte Methoden und deren Einsatz für Energiespeichermaterialien | Pfleging | 2 | 4 | mPr | ww | D |
| 2193007 | X | Materialien und Werkstoffe für die Energiewende | Seifert | 2 | 4 | mPr | ww | D |
| 2125801 | | Ober- und Grenzflächenprozesse | Maibach | 2 | 4 | mPr | WS | D |
| 2313709 | X | Plastic Electronics / Polymerelektronik | Lemmer | 2 | 3 | mPr | WS | E |
| 5072 | X | Batteries and Fuel Cells* | Ehrenberg / Scheiba | 2 | 4 | mPr | WS | E |
| 5073 | X | Hydrogen as Energy Carrier | Ehrenberg / Leon | 2 | 4 | mPr | WS | E |
| 2313745+ 2313750 | X | Solar Energy** | Richards | 4 | 6 | sPr | WS | E |
| 4020011 | X | Solid State Optics | Hetterich | 4 | 8 | mPr | WS | E |
| 2312680+ 2312694 | X | Single-Photon-Detectors | Ilin | 3 | 4 | mPr | WS | E |
| 4020021+ 4020022 | X | Nano Optics | Naber | 4 | 8 | mPr | WS | E |
| 2309486+ 2309487 | X | Optoelectronic Components | Freude | 3 | 4 | mPr | SS | E |
| 4023011+ 4023012 | X | Theoretical Quantum Optics | Rockstuhl | 3 | 6 | mPr | WS | E |

| | | | | | | | | |
|---------------------|---|---|---------|---|---|-----|----|---|
| 2313724 | X | Adaptive Optics | Gladysz | 2 | 3 | mPr | WS | E |
| 2313747+ 2313749 | X | Light and Display Engineering | Kling | 3 | 4 | mPr | WS | E |
| 2309464+ 2309465 | X | Optical Waveguides and Fibers | Koos | 3 | 4 | mPr | WS | E |
| 2309460+ 2309461 | X | Optical Transmitters and Receivers | Freude | 4 | 6 | mPr | WS | E |
| 2312670+ 2312675 | X | Thin films: technology, physics and applications I | Ilin | 3 | 4 | mPr | WS | E |
| 2312671+ 2312673 | X | Thin films: technology, physics and applications II | Ilin | 3 | 4 | mPr | SS | E |

- * Only one of the two partial achievements “Batterien und Brennstoffzellen“ and “Batteries and Fuel Cells“ may be completed in the focal course SP4.
- ** Only one of the two partial achievements “Solar Energy“ and “Photovoltaik“ (photovoltaics) may be completed in the focal course SP4.
- *** Only one of the partial achievements “Superconducting Materials“, “Superconductivity for Engineers“ and “Superconducting Magnet Technology and Power Systems “ may be completed in the focal course SP4.