

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	9
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
30.03.2022	Update of courses and examinations in the module Technical Specialization and in the focal courses
02.09.2022	Update of courses in the module Technical Specialization and in the focal courses
26.01.2023	Update of courses in the focal courses
28.06.2023	Update of courses in the focal courses
12.03.2024	Update of courses in the focal courses
03.09.2024	Update of courses in the module Technical Specialization and in the focal courses
24.02.2025	Update of courses in the module Technical Specialization and 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 Studium Generale at the Forum Wissenschaft und Gesellschaft (FORUM, formerly ZAK) 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, Korrosion Solid-state Reactions and Kinetics of Phase Transformations, Corrosion	Seifert	6	SL, mPr	6
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/FORUM 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/FORUM- 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/FORUM- 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	PA	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 + 2114844	Grundsätze der Nutzfahrzeugentwicklung I+II	Zürn	2	4	mPr	WS/SS	D
2149670	Produkt- und Produktionskonzepte für moderne Automobile	Stegmüller, Kienzle	2	4	mPr	WS	D
2123364	Produkt-, Prozess- und Ressourcenintegration in der Fahrzeugentstehung	Mbang	2	4	sPr	SS	D
2133113	Verbrennungsmotoren I	Kubach	2	4	mPr	WS	D
2134151	Verbrennungsmotoren II	Kubach	3	5	mPr	SS	D
2133108	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
2189400	Solar Thermal Energy Systems	Dagan	2	4	mPr	WS	E
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: Arbeitsorganisation	Deml	2	4	sPr	WS	D
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	Nachhaltige Fahrzeugantriebe	Toedter	2	4	mPr	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+2 4027021+2	Elektronenmikroskopie I+II (mit Übungen)	Eggeler	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 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
new	X	Composite Manufacturing - Polymers, Fibers, Semi-Finished Products, Manufacturing Technologies	Henning	2	4	sPr	SS	E
2125751		Praktikum "Technische Keramik"	Schell	2	4	SL	WS	D
2126749	X	Pulvermetallurgische Hochleistungswerkstoffe	Schell	2	4	mPr	SS	D
2173580		Mechanik und Festigkeitslehre von Kunststoffen	von Bernstorff	2	4	mPr	WS	D
2173586	X	Schwingfestigkeit	Guth	2	4	mPr	SS	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	PA	Ww	D/E
2181745		Auslegung hochbelasteter Bauteile	Aktaa	2	4	mPr	WS	D
2193055	X	High Temperature Corrosion	Gorr	2	4	mPr	WS	E
new		Vehicle Lightweight Design - Strategies, Concepts, Materials	Henning	2	4	sPr	WS	E
2181750		Plastizität auf verschiedenen Skalen	Schulz/Greiner	2	4	PA	WS	D
2182572	X	Schadenskunde	Schneider/Greiner	2	4	mPr	WS	D
2181708		Biomechanik: Design in der Natur und nach der Natur	Mattheck	2	4	SL	WS	D
2173583	X	Hydrogen in Materials: from Energy Storage to Hydrogen Embrittlement**	Pundt	2	4	mPr	SS	E
2173584	X	Hydrogen in Materials: Exercises and Lab Course***	Wagner	1	4	SL	SS	E
2174572	X	Wasserstoff in Materialien: von der Energiespeicherung zur Materialversprödung**	Pundt	2	4	mPr	WS	D
2174573	X	Wasserstoff in Materialien: Übungen und Laborkurs***	Wagner	2	4	SL	WS	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
2193051	X	Thermophysics of Advanced Materials	Sergeev	2	4	mPr	ww	E
2173421	X	Phase Transformations in Materials	Heilmaier/ Kauffmann	2	4	mPr	WS	E
2174555	X	Materialkunde der Nichteisenmetalle	Heilmaier/Gorr	3	4	mPr	SS	D
2173573	X	Thin Films – Preparation, Structure, Thermodynamics	Wagner	2	4	mPr	WS	E

2186100	X	Jenseits konventioneller Werkstoffe - Metamaterialien und 3D strukturierte Bauteile	Bauer	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.
- ** Only one of the two partial achievements “Hydrogen in Materials: from Energy Storage to Hydrogen Embrittlement“ and “Wasserstoff in Materialien: von der Energiespeicherung zur Materialversprödung“ may be completed in the focal course SP1.
- *** Only one of the two partial achievements “Hydrogen in Materials: Exercises and Lab Course “ and “Wasserstoff in Materialien: Übungen und Laborkurs “ may be completed in the focal course SP1.

Course number		Course	Lecturer	SWS	Credits	Control of success	Sem	Language
2183717	X	Seminar Werkstoffsimulation / Seminar Materials Simulation (mandatory)	Gumbsch / Nestler / Böhlke	4	8	PA	WS/SS	D/E
2181740	X	Atomistic Simulations and Particle Dynamics	Gumbsch	3	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
2182741	X	Data Science and Scientific Workflows	Gumbsch / Weygand	3	4	SL, 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
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	Klan/Günther	2	4	sPr	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
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
2182642	X	Laser Material Processing	Schneider	2	4	mPr	SS	E
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	SS	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
2149700		Projektpraktikum Additive Fertigung: Entwicklung und Fertigung eines additiven Bauteils	Zanger	2	4	PA	WS	D
2150550		Praktikum Produktionsintegrierte Messtechnik	Lanza	3	4	PA	SS	D
22929 + 22930	X	Additive Manufacturing for Process Engineering + Practical	Klahn	3	6	mPr	SS	E
2141861	X	Introduction to Microsystem Technology I	Korvink	2	4	sPr	WS	E
2142874	X	Introduction to Microsystem Technology II	Korvink	2	4	sPr	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
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 / Weinhardt	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
2312700+ 2312701	X	Bauelemente der Elektrotechnik	Kempf	4	6	sPr	WS	D
2126784		Funktionskeramiken	Hinterstein	2	4	mPr	WS	D
new	X	Mechanische Eigenschaften von Nanomaterialien und Mikrosystemen	Gruber/ Kirchlechner/ Weygand	2	4	mPr	WS	D
2178420	X	Mechanical Properties of Nanomaterials and Microsystems	Gruber/ Kirchlechner/ Weygand	2	4	mPr	SS	E
2312717 + +2312696	X	Superconducting Materials***	Holzapfel	4	6	mPr	WS/SS	E
2312708 +2312709	X	Superconductivity for Engineers***	Holzapfel/ Kempf	3	5	sPr	WS/SS	E
2312698	X	Superconducting Magnet Technology	Arndt	3	4	mPr	SS	E
2314011	X	Superconducting Power Systems	Noe	3	4	mPr	WS	E
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	WS	D
2193008	X	Engineering Materials for the Energy Transition****	Franke/Seifert	2	4	mPr	SS	E
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 two partial achievements "Superconducting Materials" and "Superconductivity for Engineers" may be completed in the focal course SP4.
- **** Only one of the two partial achievements "Materialien und Werkstoffe für die Energiewende" and "Engineering Materials for the Energy Transition" may be completed in the focal course SP4.