Modulhandbuch
für den
Masterstudiengang
Metallic Materials Technology

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Abkürzungen

KA: schriftliche Klausur / written exam
MP: mündliche Prüfung / oral examination
AP: alternative Prüfungsleistung / alternative examination
PVL: Prüfungsvorleistung / prerequisite
MP/KA: mündliche oder schriftliche Prüfungsleistung (abhängig von Teilnehmerzahl) / written or oral examination (dependent on number of students)

SS, SoSe: Sommersemester / sommer semester
WS, WiSe: Wintersemester / winter semester

SX: Lehrveranstaltung in Semester X des Moduls / lecture in module semester x

SWS: Semesterwochenstunden

Data:	AMMC MA / Examination number: 50121	Version: 03.06.2025	Start Year: WiSe 2025
Module Name:	**Additive Manufacturing of Metallic Components**		
(English):			
Responsible:	Biermann, Horst / Prof. Dr.-Ing. habil		
Lecturer(s):	Burkhardt, Christina / Dr.-Ing.		
Institute(s):	Institute of Materials Engineering		
Duration:	1 Semester(s)		
Competencies:	After successfully completing the module examination, students will master the entire process steps for the production of additively manufactured metal components. They are also able to select suitable AM processes for manufacturing of components and can estimate the effect of process parameter variations on the resulting material properties. They will also be able to select suitable test methods for assessing the quality of AM-produced materials.		
Contents:	The module treats the most important basics from the entire additive manufacturing (AM) process chain, which is essential for the production of high-quality AM components made of metal. Whereby the focus is on: • Production of powders and wires for AM • Preparation of the build jobs • Working principles of the most important AM processes available on the market (PBF-LB, PBF-EB, DED-powder, DED-wire) for the production of metallic components • Microstructure-property relationship in metals after AM processing • Influence of process parameter variations on material properties • Process control • Destructive and non-destructive material testing methods for AM components		
Literature:	L. Yang, K. Hsu, B. Baughman, D. Godfrey, F. Medina, M. Menon, S. Wiener: Additive Manufacturing of Metals: The Technology, Materials, Design and Production, Springer, Cham, 2017 (eBook) A. Gebhardt, J.-S. Hötter: Additive manufacturing: 3D printing for prototyping and manufacturing, Hanser, Munich, 2016 (eBook) S. Joshi, R. P. Martukanitz, A. R. Nassar, P. Michaleris, Additive Manufacturing with Metals, Springer, Cham, 2023 (eBook)		
Types of Teaching:	S1 (WS): Lectures (2 SWS)		
Pre-requisites:	**Recommendations:** Basic fundamentals of physics, metallic materials and materials engineering		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	3		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 90h. It is the result of 30h attendance and 60h self-studies.		

Data:	AHTEM MA Nr. 3708 / Examination number: 52601	Version: 04.07.2025	Start Year: WiSe 2025
Module Name:	**Analysis of High Temperature Processes in Extractive Metallurgy**		
(English):			
Responsible:	Charitos, Alexandros / Prof.		
Lecturer(s):	Charitos, Alexandros / Prof.		
Institute(s):	Institute of Nonferrous Metallurgy and Purest Materials		
Duration:	1 Semester(s)		
Competencies:	The goal of the module is to train the students in the analysis of high temperature processes from a process engineering perspective. After successful completion of the course, the students will be in a position to analyze aformentioned processes with regard to (i) thermodynamics (ii) fluid-dynamic phenomena during metallurgical processing (iii) link the above with unit operations and their mass and heat balances (iv) be able to conduct a short literature research and present results (v) understand troubleshooting methodology associated to these processes.		
Contents:	The lecture is divided to sub-modules: (i) **Brief thermodynamics recap** to aid understanding for the rest of the modules (ii) **Gas-solid reaction processes:** Roasting and calcination – a description of unit operations, Themodynamics – Construction of Kelogg predominance diagrams, Discussion on fluidized bed fluid dynamics, Mass and heat balances (iii) **Reduction processes:** Analysis of ferroalloy production processes with focus on silicon/ ferrosilicon is included amongst other examples, Discussion on the Pidgeon process for the production of magnesium (iv) **Oxidative smelting processes:** The extractive metallurgy of copper / matte smelting fundamentals / bath and flash smelters (mass and heat balances) / P-S converters / fire refining – casting and brief description in electrorefining (v) **Electrolysis in molten salt baths:** Introduction to the Hall Heroult process for aluminium production (vi) **Recycling processes:** Introduction to Li-ion battery and electronic waste recycling processes.		
Literature:	Gaskell D.R., Laughlin D.E.: Introduction to the Thermodynamics of Materials Gilchrist J.D.: Extraction Metallurgy Schlessinger M.E., King M.J., Sole K.C., Davenport W.G.: The extr. metallurgy of copper Schei A., Tuset J.Kr., Tveit H.: Production of High Silicon Alloys Kunii D., Levenspiel O.: Fluidization Engineering		
Types of Teaching:	S1 (WS): Lectures (4 SWS) S1 (WS): Presentation of the assignment / Seminar (1 SWS)		
Pre-requisites:	**Recommendations:** Revision of courses associated to metallurgical thermodynamics		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: PVL: Assignment KA [180 min] There is the possibility of obtaining additional points for the written examination through the assignment. PVL have to be satisfied before the examination.		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: PVL: Schriftliche Ausarbeitung KA [180 min]		

	Es besteht die Möglichkeit, durch die schriftliche Ausarbeitung Zusatzpunkte für die Klausur zu erzielen. PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.
Credit Points:	7
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]
Workload:	The workload is 210h. It is the result of 75h attendance and 135h self-studies.

Data:	BCT. MA. Nr. 3689 / Examination number: 51002	Version: 11.11.2019	Start Year: SoSe 2020
Module Name:	**Basics of Coatings Technology**		
(English):			
Responsible:	Rafaja, David / Prof. Dr. rer. nat. habil.		
Lecturer(s):	Wüstefeld, Christina / Dr.-Ing.		
Institute(s):	Institute of Materials Science		
Duration:	1 Semester(s)		
Competencies:	The student understands the fundamentals of various procedures for deposition of thin and thick layers and is able to assess the consequences of the applied procedures on the properties of the layers.		
Contents:	Physical vapour deposition, chemical vapour deposition, layer formation, layer materials, electroplating, thermal spraying, hot dip coating, mechanical plating, characterization of thin films and layers.		
Literature:	M. Ohring: Materials science of thin films, Academic Press, Elsevier, San Diego, 2003; D. M. Mattox: Handbook of Physical Vapor Deposition (PVD) Processing, William Andrew, Elsevier, Oxford, 2010; Fr. W. Bach, T. Duda: Moderne Beschichtungsverfahren, WILEY-VCH Verlag GmbH Weinheim, 2000		
Types of Teaching:	S1 (SS): Lectures (3 SWS)		
Pre-requisites:			
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	4		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies.		

Daten:	DEU A1/ 1.Sem. BA. Nr. 948 / Prüfungs-Nr.: 71101	Stand: 04.08.2017	Start: WiSe 2016
Modulname:	**Deutsch A1/ 1. Semester**		
(englisch):	German A 1/ 1st Semester		
Verantwortlich(e):	Polanski, Katja		
Dozent(en):			
Institut(e):	Internationales Universitätszentrum/ Sprachen		
Dauer:	1 Semester		
Qualifikationsziele / Kompetenzen:	Im Kurs werden Grundlagen in Phonetik, Orthographie, Grammatik und Lexik vermittelt. Die Teilnehmer erwerben Grundkenntnisse und Grundfertigkeiten im Hören, Sprechen, Lesen und Schreiben auf der Basis der Allgemeinsprache sowie landeskundliche Kenntnisse.		
Inhalte:	Kommunikation im Alltag (Menschen kennen lernen, Einkaufen, Restaurantbesuch, Tagesabläufe, Uhrzeit); Grammatik: zum Beispiel Fragestellungen, Zahlen, Konjugation der Verben, Präsenz und Präteritum, Mengenangaben, Plural der Nomen, Komposita		
Typische Fachliteratur:	Begegnungen A1+, Schubert Verlag		
Lehrformen:	S1 (WS): Übung (4 SWS)		
Voraussetzungen für die Teilnahme:	**Empfohlen:** Keine Vorkenntnisse der deutschen Sprache notwendig		
Turnus:	jährlich im Wintersemester		
Voraussetzungen für die Vergabe von Leistungspunkten:	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min] PVL: Aktive Teilnahme an mindestens 80% des Unterrichts PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.		
Leistungspunkte:	4		
Note:	Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): KA [w: 1]		
Arbeitsaufwand:	Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium.		

Daten:	DEU A1/ 2. Sem. BA. Nr. 949 / Prüfungs-Nr.: 71102	Stand: 04.08.2017	Start: SoSe 2017
Modulname:	**Deutsch A1/ 2. Semester**		
(englisch):	German A1/ 2nd Semester		
Verantwortlich(e):	Polanski, Katja		
Dozent(en):			
Institut(e):	Internationales Universitätszentrum/ Sprachen		
Dauer:	1 Semester		
Qualifikationsziele / Kompetenzen:	Im Kurs werden Grundlagen in Phonetik, Orthographie, Grammatik und Lexik vermittelt. Die Teilnehmer erwerben Grundkenntnisse und Grundfertigkeiten im Hören, Sprechen, Lesen und Schreiben auf der Basis der Allgemeinsprache sowie landeskundliche Kenntnisse.		
Inhalte:	Orientierung in der Stadt beziehungsweise in der Firma, öffentliche Verkehrsmittel, Wegbeschreibung, Berufe und Arbeitsalltag, Körper und Gesundheit, Wohnungssuche und -einrichtung, Lebenslauf, Kleidung; Grammatik: zum Beispiel Präpositionen, Frageartikel, Modalverben, Possessivartikel, Perfekt, Konjunktionen, Demonstrativpronomen, Graduierung und Komparativ		
Typische Fachliteratur:	Begegnungen A1+, Schubert Verlag		
Lehrformen:	S1 (SS): Übung (4 SWS)		
Voraussetzungen für die Teilnahme:	**Obligatorisch:** Deutsch A1/ 1. Semester, 2015-08-26 oder äquivalente Sprachkenntnisse		
Turnus:	jährlich im Sommersemester		
Voraussetzungen für die Vergabe von Leistungspunkten:	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min] PVL: Aktive Teilnahme an mind. 80% des Unterrichts PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.		
Leistungspunkte:	4		
Note:	Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): KA [w: 1]		
Arbeitsaufwand:	Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium. Der Zeitaufwand beträgt 120 Stunden und setzt sich zusammen aus 60 Stunden Präsenzzeit und 60 Stunden Selbststudium.		

Daten:	DEU A2/1. Sem. BA.Nr. 950 / Prüfungs-Nr.: 71103	Stand: 04.08.2017	Start: WiSe 2016
Modulname:	**Deutsch A2/ 1. Semester**		
(englisch):	German A2/ 1st Semester		
Verantwortlich(e):	Polanski, Katja		
Dozent(en):			
Institut(e):	Internationales Universitätszentrum/ Sprachen		
Dauer:	1 Semester		
Qualifikationsziele / Kompetenzen:	Die Teilnehmer erweitern ihre Kenntnisse zu Grundlagen der deutschen Grammatik sowie ihren allgemeinsprachlichen Wortschatz und führen Gespräche zu verschiedenen Themen des Alltags.		
Inhalte:	Familie und Verwandtschaft, Feste und Feiern in Deutschland, Wohnung und Wohnungseinrichtung, Schule und Ausbildung, Aussehen und Mode, Jahreszeiten, Wetter und Urlaub, Aspekte der Geschichte (Deutschland, Österreich, Schweiz); Grammatik: z.B. Nebensätze mit weil, wenn, dass; Rektion der Verben; Ordinalzahlen; Präpositionen; Reflexivpronomen; Zukunft ausdrücken; Adjektivdeklination		
Typische Fachliteratur:	Begegnungen A2+, Schubert Verlag		
Lehrformen:	S1 (WS): Übung (4 SWS)		
Voraussetzungen für die Teilnahme:	**Obligatorisch:** Deutsch A1/ 2. Semester, 2015-08-26 oder äquivalente Sprachkenntnisse		
Turnus:	jährlich im Wintersemester		
Voraussetzungen für die Vergabe von Leistungspunkten:	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min] PVL: Aktive Teilnahme an mind. 80% d. Unterrichts PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.		
Leistungspunkte:	4		
Note:	Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): KA [w: 1]		
Arbeitsaufwand:	Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium.		

Daten:	DEUA/2.Sem BA.Nr. 951 / Prüfungs-Nr.: 71105	Stand: 26.08.2015	Start: SoSe 2017
Modulname:	**Deutsch A2/ 2. Semester**		
(englisch):	German A2/ 2nd Semester		
Verantwortlich(e):	Polanski, Katja		
Dozent(en):			
Institut(e):	Internationales Universitätszentrum/ Sprachen		
Dauer:	1 Semester		
Qualifikationsziele / Kompetenzen:	Die Teilnehmer erweitern ihre Kenntnisse zu Grundlagen der deutschen Grammatik sowie ihren allgemeinsprachlichen Wortschatz und führen Gespräche zu verschiedenen Themen des Alltags.		
Inhalte:	Freizeitaktivitäten (Sport, Vereine), Arbeit und Arbeitssuche, Politik in Deutschland, Städte (Leipzig, Berlin), Verkehr und Verkehrsmittel, Medien, Fernsehen in Deutschland, Kulturelle Unterschiede; Grammatik: z.B. Indefinita, Relativsätze, Nebensätze mit bevor, bis, als, deshalb, wenn, Konjunktiv II,		
Typische Fachliteratur:	Begegnungen A2+, Schubert Verlag		
Lehrformen:	S1 (SS): Übung (4 SWS)		
Voraussetzungen für die Teilnahme:	**Obligatorisch:** Deutsch A2/ 1. Semester, 2015-08-26 oder äquivalente Sprachkenntnisse		
Turnus:	jährlich im Sommersemester		
Voraussetzungen für die Vergabe von Leistungspunkten:	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min] PVL: Aktive Teilnahme an mind. 80% d. Unterrichts PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.		
Leistungspunkte:	4		
Note:	Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): KA [w: 1]		
Arbeitsaufwand:	Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium.		

Daten:	DEUB1/1.Sem. Nr. 952 / Prüfungs-Nr.: 71104	Stand: 04.08.2017	Start: WiSe 2016
Modulname:	**Deutsch B1/ 1. Semester**		
(englisch):	German B1/ 1st Semester		
Verantwortlich(e):	Polanski, Katja		
Dozent(en):			
Institut(e):	Internationales Universitätszentrum/ Sprachen		
Dauer:	1 Semester		
Qualifikationsziele / Kompetenzen:	Die Teilnehmer bauen die in den Modulen Deutsch A1 und A2 erworbenen sprachlichen Kenntnisse und Fertigkeiten unter besonderer Berücksichtigung der mündlichen Kommunikation aus. Sie wiederholen und erweitern ihren Wortschatz. Auf der Basis aktueller und historischer Texte erhalten die Teilnehmer landeskundliche Informationen über die Bundesrepublik Deutschland.		
Inhalte:	Zusammenleben der Menschen in Deutschland (Wohn- und Lebensformen, Vorstellungen über berufliche Entwicklung und Freizeitgestaltung, Konsumverhalten, Beziehung zur Natur)		
Typische Fachliteratur:	Begegnungen B1+, Schubert Verlag		
Lehrformen:	S1 (WS): Übung (4 SWS)		
Voraussetzungen für die Teilnahme:	**Obligatorisch:** Deutsch A2/ 2. Semester, 2015-08-26 oder äquivalente Sprachkenntnisse		
Turnus:	jährlich im Wintersemester		
Voraussetzungen für die Vergabe von Leistungspunkten:	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min] PVL: Aktive Teilnahme an mind. 80% d. Unterrichts PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.		
Leistungspunkte:	4		
Note:	Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): KA [w: 1]		
Arbeitsaufwand:	Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium.		

Daten:	DEUB1/2. Sem. 953 / Prüfungs-Nr.: 71106	Stand: 26.08.2015	Start: SoSe 2017
Modulname:	**Deutsch B1/ 2. Semester**		
(englisch):	German B1/ 2nd Semester		
Verantwortlich(e):	Polanski, Katja		
Dozent(en):			
Institut(e):	Internationales Universitätszentrum/ Sprachen		
Dauer:	1 Semester		
Qualifikationsziele / Kompetenzen:	Die Teilnehmer bauen die in dem Modul Deutsch b1/1.Semster erworbenen sprachlichen Kenntnisse und Fertigkeiten unter besonderer Berücksichtigung der mündlichen Kommunikation aus. Sie wiederholen und erweitern ihren Wortschatz. Auf der Basis aktueller und historischer Texte erhalten die Teilnehmer landeskundliche Informationen über die Bundesrepublik Deutschland.		
Inhalte:	Zusammenleben der Menschen in Deutschland (Wohn- und Lebensformen, Vorstellungen über berufliche Entwicklung und Freizeitgestaltung, Konsumverhalten, Beziehung zur Natur)		
Typische Fachliteratur:	Begegnungen B1+, Schubert Verlag		
Lehrformen:	S1 (SS): Übung (4 SWS)		
Voraussetzungen für die Teilnahme:	**Obligatorisch:** Deutsch B1/ 1.Semester, 2015-08-26 oder äquivalente Sprachkenntnisse		
Turnus:	jährlich im Sommersemester		
Voraussetzungen für die Vergabe von Leistungspunkten:	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min] PVL: Aktive Teilnahme an mind. 80% d. Unterrichts PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.		
Leistungspunkte:	4		
Note:	Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): KA [w: 1]		
Arbeitsaufwand:	Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium.		

Daten:	B2.1 BA. Nr. 3636 / Prüfungs-Nr.: 70311	Stand: 05.05.2022	Start: WiSe 2016
Modulname:	**Deutsch B2/ 1. Semester**		
(englisch):	German B2/ 1st Semester		
Verantwortlich(e):	Polanski, Katja		
Dozent(en):			
Institut(e):	Internationales Universitätszentrum/ Sprachen		
Dauer:	1 Semester		
Qualifikationsziele / Kompetenzen:	Die Teilnehmer bauen ihre sprachlichen Kenntnisse und Fertigkeiten auf dem Niveau B2.1 aus. Mithilfe handlungsorientierter Aufgaben und Aktivitäten entwickeln die Teilnehmer ihre Kenntnisse zu Lernstrategien, Grammatik, Wortschatz, Landeskunde und interkulturellen Aspekten weiter. Die Teilnehmer verstehen den Hauptinhalt komplexer, authentischer Texte. Sie können längeren Redebeiträgen folgen und sich spontan und fließend verständigen. Sie können sich zu einem breiten Themenbereich klar und detailliert ausdrücken, ihren Standpunkt erläutern und die Vor- und Nachteile verschiedener Möglichkeiten angeben.		
Inhalte:	globales, selektives, detailliertes Hör- und Leseverstehen; Halten eines strukturierten Kurzvortrags, Textproduktion, z.B. Grafikbeschreibung, Erörterung, mündliche und schriftliche Stellungnahme; sprachliche Strukturen und Wortschatz gemäß Lehrmaterial (u.a. Satzbau, verschiedene Satzkombinationen, Passivformen, Nominalisierung, Wortbildung)		
Typische Fachliteratur:	Kompass DaF B2.1 (Klett Verlag)		
Lehrformen:	S1 (WS): Übung (4 SWS)		
Voraussetzungen für die Teilnahme:	**Obligatorisch:** Deutsch B1/ 2.Semester oder äquivalente Sprachkenntnisse		
Turnus:	jährlich im Wintersemester		
Voraussetzungen für die Vergabe von Leistungspunkten:	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: AP: Portfolioprüfung bestehend aus 4 Teilen zum Nachweis aller Sprachfertigkeiten (Hörverstehen, Leseverstehen, Sprechen, Schreiben) AP: Aufgaben und aktive Teilnahme an mind. 80% d. Unterrichts		
Leistungspunkte:	4		
Note:	Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): AP: Portfolioprüfung bestehend aus 4 Teilen zum Nachweis aller Sprachfertigkeiten (Hörverstehen, Leseverstehen, Sprechen, Schreiben) [w: 1]		
Arbeitsaufwand:	Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium. Letzteres umfasst die Vor- und Nachbereitung von Lehrveranstaltungen sowie die Vorbereitung der Aufgaben und der Prüfungsleistung.		

Daten:	B2.2 BA. Nr. / Prüfungs-Nr.: 70312	Stand: 05.05.2022	Start: SoSe 2017
Modulname:	**Deutsch B2/ 2. Semester**		
(englisch):	German B2/ 2nd Semester		
Verantwortlich(e):	Polanski, Katja		
Dozent(en):			
Institut(e):	Internationales Universitätszentrum/ Sprachen		
Dauer:	1 Semester		
Qualifikationsziele / Kompetenzen:	Die Teilnehmer bauen ihre sprachlichen Kenntnisse und Fertigkeiten auf dem Niveau B2.2 aus. Mithilfe handlungsorientierter Aufgaben und Aktivitäten entwickeln die Teilnehmer ihre Kenntnisse zu Lernstrategien, Grammatik, Wortschatz, Landeskunde und interkulturellen Aspekten weiter. Die Teilnehmer verstehen den Hauptinhalt komplexer, authentischer Texte. Sie können längeren Redebeiträgen folgen und sich spontan und fließend verständigen. Sie können sich zu einem breiten Themenbereich klar und detailliert ausdrücken, ihren Standpunkt erläutern und die Vor- und Nachteile verschiedener Möglichkeiten angeben.		
Inhalte:	Schriftliches und mündliches Zusammenfassen von Texten; informelle/ formelle E-Mails schreiben; Grafikinterpretation; in einer Diskussion Tatsachen, Meinungen und Argumentation erkennen, auf Redebeiträge eingehen und eigene Redebeiträge halten; Grammatik und Wortschatz gemäß Lehrmaterial (u.a. Textzusammenhang; Partizipien als Adjektiv, indirekte Rede, Konjunktiv I & II, Modalsätze; Passiversatz; Wortbildung; Nomen-Verb-Verbindungen)		
Typische Fachliteratur:	Kompass DaF B2.2 (Klett Verlag)		
Lehrformen:	S1 (SS): Übung (4 SWS)		
Voraussetzungen für die Teilnahme:	**Obligatorisch:** Deutsch B2/ 1. Semester, 2016-04-04 oder äquivalente Sprachkenntnisse		
Turnus:	jährlich im Sommersemester		
Voraussetzungen für die Vergabe von Leistungspunkten:	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: AP: Portfolioprüfung bestehend aus 4 Teilen zum Nachweis aller Sprachfertigkeiten (Hörverstehen, Leseverstehen, Sprechen, Schreiben) AP: Aufgaben und aktive Teilnahme an mind. 80% d. Unterrichts		
Leistungspunkte:	4		
Note:	Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): AP: Portfolioprüfung bestehend aus 4 Teilen zum Nachweis aller Sprachfertigkeiten (Hörverstehen, Leseverstehen, Sprechen, Schreiben) [w: 1]		
Arbeitsaufwand:	Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium. Letzteres umfasst die Vor- und Nachbereitung von Lehrveranstaltungen sowie die Vorbereitung der Aufgaben und der Prüfungsleistung.		

Data:	MechTest. MA. Nr. 3207 / Examination number: 50409	Version: 05.04.2018	Start Year: WiSe 2018
Module Name:	**Experimental Methods of Structure Characterization of Matters**		
(English):			
Responsible:	Rafaja, David / Prof. Dr. rer. nat. habil.		
Lecturer(s):	Wüstefeld, Christina / Dr.-Ing.		
Institute(s):	Institute of Materials Science		
Duration:	1 Semester(s)		
Competencies:	Students get familiar with basic principles and applications of selected methods for microstructure analysis of matters (mainly optical, scanning and transmission electron microscopy, diffraction methods) and learn how these methods can be used for analysis of the real structure of materials.		
Contents:	- Crystal symmetry operations, point and space groups in crystallography - Interaction of electrons, X-rays and neutrons with matter - Applications of optical, scanning and transmission electron microscopy, and X-ray, electron and neutron diffraction in the analysis of real structure and microstructure of matters: - Phase identification and quantification, use of crystallographic databases - Determination of the grain and crystallite size, - Global and local preferred orientation of crystallites - Residual stress analysis		
Literature:	- L. Reimer: Scanning Electron Microscopy, Springer, Berlin 2010 - V. Randle, O. Engler: Introduction to texture analysis, macrotexture, microtexture and orientation mapping, Gordon & Breach, Amsterdam, 2000. - H.P. Klug, L.E. Alexander: X-ray diffraction procedures for polycrystalline and amorphous materials, New York, Wiley, 2nd edition 1974. - C. Giacovazzo, H.L. Monaco, G. Artioli et al.: Fundamentals of Crystallography, IUCr Texts on Crystallography 15, 3rd edition, 2011 - D.B. Williams, C.B. Carter: Transmission Electron Microscopy: A Textbook for Materials Science, Springer, New York 2016		
Types of Teaching:	S1 (WS): Lectures (3 SWS)		
Pre-requisites:	**Recommendations:** Profound knowledge of English, basics in materials science, mechanics, advanced mathematics, physics for scientists.		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 5 students or more) [MP minimum 30 min / KA 120 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 5 und mehr Teilnehmern) [MP mindestens 30 min / KA 120 min]		
Credit Points:	4		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies.		

Data:	GRH. MA. 3549 / Examination number: 52802	Version: 14.07.2022	Start Year: WiSe 2023
Module Name:	**Extractive Metallurgy and Recycling of High-Tech Metals (Strategic Metals)**		
(English):			
Responsible:	Scharf, Christiane / Prof. Dr.-Ing.		
Lecturer(s):	Scharf, Christiane / Prof. Dr.-Ing.		
Institute(s):	Institute of Nonferrous Metallurgy and Purest Materials		
Duration:	1 Semester(s)		
Competencies:	Students are able to assess the possibilities and technical aspects of the unit operations covered and their potential for the recycling of high-tech metals. To do this, they can apply the thermodynamic data and calculations to develop new processes. Students can combine the technological sub-areas and thus develop new ways for recycling processes.		
Contents:	Overview of strategic metals, their properties, raw materials, use and production. Thermodynamic data of oxides, sulphides, chlorides, and fluorides. Scheme of metal production. Unit Operations of ultrapure metal production. Extraction and recycling in particular of the metals germanium, gallium, indium, lanthanides and actinides. Enrichment in the material flows of metallurgy of the main metals copper, zinc, lead and aluminum. Extraction of the strategic metals from the enriched intermediates by pyro- and hydrometallurgical processes. Processing into ultrapure metals by metallurgical refining processes.		
Literature:	-C.K.Gupta, N.Krishnamurthy: Extractive Metallurgy of Rare Earth. CRC Press 2005 -F.Habashi: Handbook of Extractive Metallurgy. Wiley VCH 1997 -Ullmann's Encyclopedia of Industrial Chemistry. Wiley 1999-2014		
Types of Teaching:	S1 (WS): Lectures (4 SWS)		
Pre-requisites:	**Recommendations:** Basics of Hydrometallurgy, Basics of Pyrometallurgy		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 11 students or more) [MP minimum 30 min / KA 60 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 11 und mehr Teilnehmern) [MP mindestens 30 min / KA 60 min]		
Credit Points:	6		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 180h. It is the result of 60h attendance and 120h self-studies.		

Daten:	DEUING. BA. Nr. 076 / Prüfungs-Nr.: 70301	Stand: 30.11.2021	Start: WiSe 2021
Modulname:	**Fachsprache Deutsch für Ingenieure**		
(englisch):	German for Engineers		
Verantwortlich(e):	Polanski, Katja		
Dozent(en):			
Institut(e):	Internationales Universitätszentrum/ Sprachen		
Dauer:	1 Semester		
Qualifikationsziele / Kompetenzen:	Die Teilnehmer machen sich mit wesentlichen sprachlichen Merkmalen und typischen Strukturen von mündlichen und schriftlichen Fachtexten vertraut. Sie erwerben Strategien zum Hörverstehen, Leseverstehen, akademischen Schreiben und Präsentieren, können diese bei der eigenen Textrezeption und Textproduktion anwenden, um die mit dem Studium verbundenen sprachlich-kommunikativen Aufgaben zu bewältigen.		
Inhalte:	• Definieren, Klassifizieren • Prozessbeschreibung • Zusammenfassung und Analyse • Präsentieren und Visualisieren • Sprachliche Strukturen • Grundlagen und Grundbegriffe anhand des fachlichen Profils der TU Bergakademie Freiberg; z.B. der Materialwissenschaften, Maschinenbau, Verfahrens- und Energietechnik		
Typische Fachliteratur:	Internes Lehrmaterial		
Lehrformen:	S1 (WS): Übung (4 SWS)		
Voraussetzungen für die Teilnahme:	**Obligatorisch:** Sprachniveau C1, z.B. DSH-2 oder äquivalente Sprachkenntnisse, in Ausnahmefällen Sprachniveau B2		
Turnus:	jedes Semester		
Voraussetzungen für die Vergabe von Leistungspunkten:	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: AP: Portfolioprüfung bestehend aus 4 Teilen AP: Aufgaben und aktive Teilnahme an mind. 80% d. Lehrveranstaltungen		
Leistungspunkte:	4		
Note:	Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): AP: Portfolioprüfung bestehend aus 4 Teilen [w: 1]		
Arbeitsaufwand:	Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium. Letzteres umfasst die Vor- und Nachbereitung von Lehrveranstaltungen sowie die Vorbereitung der Aufgaben und der Prüfungsleistung.		

Data:	FPD. MA. Nr. 3566 / Examination number: 50226	Version: 27.06.2022	Start Year: SoSe 2024
Module Name:	**Foundry Process Design**		
(English):			
Responsible:	Wolf, Gotthard / Prof. Dr.-Ing.		
Lecturer(s):	Szucki, Michał / Prof. Dr.-Ing.		
Institute(s):	Foundry Institute		
Duration:	1 Semester(s)		
Competencies:	- Acquisition of connections of process cycles in foundries and basics of management - Students are able to apply the knowledge in the professional life		
Contents:	Introduction to production process of foundries; Basics of designs of divisions of foundries; Finishing treatment of castings and non-destructive testing; Introduction in a modern philosophy of quality		
Literature:	Minkhoff, I.: The Physical Metallurgy of Cast Iron. Haifa, John Wiley and Sons, 1983 Dötsch, E.: Inductive Melting and Holding. Vulkan Kurz, W., Fisher, D.J.:Fundamentals of Solidification. Trans Tech Publications, 1989 Campbell, J.: Castings. Butterworth-Heinemann, 2003 Flemings, M.C.: Solidification Processing. McGraw-Hill Series in Materials Science and Engineering		
Types of Teaching:	S1 (SS): Lectures (4 SWS) S1 (SS): Exercises (1 SWS)		
Pre-requisites:			
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	7		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 210h. It is the result of 75h attendance and 135h self-studies.		

Data:	FFMAT. MA. Nr. 3569 / Examination number: 50930	Version: 17.06.2019	Start Year: WiSe 2018
Module Name:	**Fundamentals of Ferrous Materials**		
(English):			
Responsible:	Volkova, Olena / Prof. Dr.-Ing.		
Lecturer(s):	Wendler, Marco / Dr.-Ing.		
Institute(s):	Institute of Iron and Steel Technology		
Duration:	1 Semester(s)		
Competencies:	The students learn to apply their fundamental knowledge of the materials science and engineering to the class of ferrous materials. Upon successful completion of the module, the students are familiar with the standard designation of steels and the heat treatment conditions associated with different microstructure formation processes. The module enables an understanding of the principles and considerations in the design of steels and the possibilities to adjust the microstructure.		
Contents:	Standard Designation of Steels, Structure and Properties of Pure Iron, Phase Diagrams, Constitution of Steels, Solubility Limit and Precipitation, Cast Irons, Ferrous Alloys under Equilibrium and Non-Equilibrium Conditions, Austenite Transformation Products, Hardenability and Transformation Diagrams		
Literature:	• B.C. De Cooman, J. Speer, Fundamentals of Steel Product Physical Metallurgy, Assn. of Iron and Steel Engineers, 1st Ed., 2011. • H.K.D.H. Bhadeshia and R.W,K. Honeycombe, Steels: Microstructure and Properties, Butterworth-Heinemann, 4th Ed., 2017.04.12 W.		
Types of Teaching:	S1 (WS): Lectures (2 SWS) S1 (WS): Seminar (1 SWS)		
Pre-requisites:	**Recommendations:** Knowledge of the fundamentals of materials science and engineering		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	4		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies.		

Data:	MA. Nr. / Examination number: 50234	Version: 21.02.2022	Start Year: SoSe 2023
Module Name:	**Fundamentals of Foundry Technology**		
(English):			
Responsible:	Wolf, Gotthard / Prof. Dr.-Ing.		
Lecturer(s):	Dommaschk, Claudia / Dr.-Ing. Wolf, Gotthard / Prof. Dr.-Ing.		
Institute(s):	Foundry Institute		
Duration:	1 Semester(s)		
Competencies:	Students are introduced into the fundamentals of foundry technology and are able to understand the structure of foundry technology. This knowledge is important as a basic knowledge for specialized studies of foundry technology.		
Contents:	Introduction to foundry technology, overview of casting processes, fundamentals of moulding technology and moulding processes, permanent moulding processes, overview of casting materials and their application.		
Literature:	Beeley, P.: Foundry Technology, Butterworth-Heinemann, 2001 or e-book		
Types of Teaching:	S1 (SS): Lectures (3 SWS)		
Pre-requisites:			
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 150h. It is the result of 45h attendance and 105h self-studies.		

Data:	FPD. MA. Nr. 3562 / Examination number: 50329	Version: 24.06.2022	Start Year: SoSe 2023
Module Name:	**Fundamentals of Metal Forming**		
(English):			
Responsible:	Prahl, Ulrich / Prof. Dr.-Ing.		
Lecturer(s):	Prahl, Ulrich / Prof. Dr.-Ing.		
Institute(s):	Institute of Metal Forming		
Duration:	1 Semester(s)		
Competencies:	Consolidated knowledge on the basics of plastic deformation (deformation mechanisms, flow stress, influences on flow stress, classification of forming processes, flow conditions). Students will be capacitated to understand and define strain and tension conditions in forming processes, geometric and kinematic conditions as well as calculating required force and work.		
Contents:	• Introduction into the subject field • Mechanisms of plastic deformation • Definition of forming specific characteristics • Flow stress behavior during hot and cold forming (including influences on flow stress) • Softening and hardening behavior • Methods to determine of flow stress • Constitutive equations in forming • Analytic determination of force and work • Introduction of several forming processes		
Literature:	Gottstein, Günter: Physical Foundation of Materials Science. Springer, 2004 Kachanov, L.M.: Fundamentals of the Theory of Plasticity, Dover Publications Dixit, P.M.: Plasticity Fundamentals and Application, CRC Press, Taylor&Francis Group		
Types of Teaching:	S1 (SS): Lectures (3 SWS)		
Pre-requisites:			
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 150h. It is the result of 45h attendance and 105h self-studies.		

Data:	FSP MA. Nr. / Examination number: 50938	Version: 07.07.2022	Start Year: SoSe 2023
Module Name:	**Fundamentals of Steel Processing**		
(English):			
Responsible:	Volkova, Olena / Prof. Dr.-Ing.		
Lecturer(s):			
Institute(s):	Institute of Iron and Steel Technology		
Duration:	1 Semester(s)		
Competencies:	Students will be able to understand the structure of basics of iron and steel making and to apply basic aspects. Resource competence for the use of raw and secondar materials in iron and steel making. This knowledge is important as a basic knowledge for specialized studies of steel technology.		
Contents:	• Ore processing, sintering, pelletizing, direct reduction and smelting reduction processes • Overview of steel making processe, decarburization, dephosphorization • Introduction in secondary metallurgy, deoxidation, degassing, desulfurization, gas stirring • Overview of casting processes • Global trends in iron and steel making (green steel, clean steel, H2-metallurgy) • Circular economy in iron and steel making (reduce, reuse, remanufacture, recycling, water management, dust management, slag management) • Environmental impact of steel industry		
Literature:	S. Seetharaman, TREATISE ON PROCESS METALLURGY, Elsevier, 2014		
Types of Teaching:	S1 (SS): Lectures (3 SWS)		
Pre-requisites:			
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 150h. It is the result of 45h attendance and 105h self-studies.		

Data:	HYDROME. MA. Nr. 264 / Examination number: 52804	Version: 26.01.2024	Start Year: SoSe 2025
Module Name:	**Hydrometallurgy**		
(English):			
Responsible:	Scharf, Christiane / Prof. Dr.-Ing.		
Lecturer(s):	Scharf, Christiane / Prof. Dr.-Ing.		
Institute(s):	Institute of Nonferrous Metallurgy and Purest Materials		
Duration:	1 Semester(s)		
Competencies:	The aim is to impart specialist knowledge in the field of extraction, refining and recycling of non-ferrous metals (Cu, Pb, Zn, Al, Mg, Ti) using hydrometallurgical processes and to describe selected technological processes.		
Contents:	General principles of hydrometallurgy, solubility of solids and gases in liquids, transport kinetics, diffusion, convection, chemical thermodynamics, potential-pH-diagrams, partial pressure-pH-diagrams, chemical kinetics, homogeneous and heterogeneous reactions, water management and environmental protection requirements for the operation of hydrometallurgical plants, leaching, solvents and digestion agents, leaching processes, reactors for leaching, solid-liquid separation, precipitation and crystallization, separation processes (ion exchange, liquid-liquid extraction, membrane process). For example, hydrometallurgical copper extraction from oxide raw materials, hydrometallurgical zinc extraction from roasted zinc blende and production of alumina according to the Bayer process.		
Literature:	F. Habashi: Textbook of Hydrometallurgy , Quebec 1999 J. D. Gilchrist: Extraction Metallurgy, 3rd edition, Pergamon Press 1989 D: R. Lide: CRC Handbook of Chemistry and Physics, CRC Press, Edition 1997 – 1998 M. Pourbaix: Atlas of electrochemical equilibria in aqueous solutions, Pergamon Press 1966, CCC No. 65-11670 TMS: Hydrometallurgy – a short course, 1973 G.M. Ritcey, A.W. Ashbrook: Solvent Extraction, Part I + II, Elsevier 1984 (I), 1979 (II), ISBN 0-444-41770-2 (I), ISBN 0-444-41771-0 (II) Michael L. Free: Hydrometallurgy, 2nd edition, 21.2.2021, 978-3-030-88086-6, TMS series A.R. Burkin: Chemical Hydrometallurgy, ICP, 2001, 978-1-86094-184-9 M. Shamsuddin: Physical Chemistry of Metallurgical Processes, 10.2.2016, 978-1-119-07832-6 Seshadri Seetharaman: Treatise on Process Metallurgy, 3-Volume Set, 1st Edition - December 23, 2013, ISBN: 9780080969510 Roderick Guthrie, Seshadri Seetharaman, Alexander McLean, Sridhar Seetharaman, H. Y. Sohn: Treatise on Process Metallurgy, Volume 4, Industrial Plant Design and Process Modeling, 2nd Edition - June 3, 2024, ISBN: 9780323854801, eBook ISBN: 9780323854818		
Types of Teaching:	S1 (SS): Lectures (3 SWS) S1 (SS): Exercises (1 SWS)		
Pre-requisites:	**Recommendations:** Knowledge from the modules “General, Inorganic and Organic Chemistry” and “Fundamentals of Physical Chemistry”.		
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 11 students or more) [MP minimum 30 min / KA 60 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen		

	der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 11 und mehr Teilnehmern) [MP mindestens 30 min / KA 60 min]
Credit Points:	5
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]
Workload:	The workload is 150h. It is the result of 60h attendance and 90h self-studies. The latter includes the follow-up of the course and the preparation for the exam.

Data:	HYDROMEL. MA. Nr. (only for students MMT-NFe) / Examination number: 52804	Version: 04.03.2026	Start Year: SoSe 2026
Module Name:	**Hydrometallurgy with Lab**		
(English):			
Responsible:	Scharf, Christiane / Prof. Dr.-Ing.		
Lecturer(s):	Scharf, Christiane / Prof. Dr.-Ing.		
Institute(s):	Institute of Nonferrous Metallurgy and Purest Materials		
Duration:	1 Semester(s)		
Competencies:	The aim is to impart specialist knowledge in the field of extraction, refining and recycling of non-ferrous metals (Cu, Pb, Zn, Al, Mg, Ti) using hydrometallurgical processes and to describe selected technological processes.		
Contents:	General principles of hydrometallurgy, solubility of solids and gases in liquids, transport kinetics, diffusion, convection, chemical thermodynamics, potential-pH-diagrams, partial pressure-pH-diagrams, chemical kinetics, homogeneous and heterogeneous reactions, water management and environmental protection requirements for the operation of hydrometallurgical plants, leaching, solvents and digestion agents, leaching processes, reactors for leaching, solid-liquid separation, precipitation and crystallization, separation processes (ion exchange, liquid-liquid extraction, membrane process). For example, hydrometallurgical copper extraction from oxide raw materials, hydrometallurgical zinc extraction from roasted zinc blende and production of alumina according to the Bayer process. Practical courses in hydrometallurgical copper production • copper leaching (influence of temperature/activation energy calculation/titration of copper as analytical method), • copper extraction (liquid-liquid-extraction with LIX/influence of concentration/statistical evaluation/analysis with AAS) and • copper electrowinning (principle of electrolysis/influence of additives on deposition/simple mass balance)		
Literature:	F. Habashi: Textbook of Hydrometallurgy , Quebec 1999 J. D. Gilchrist: Extraction Metallurgy, 3rd edition, Pergamon Press 1989 D: R. Lide: CRC Handbook of Chemistry and Physics, CRC Press, Edition 1997 – 1998 M. Pourbaix: Atlas of electrochemical equilibria in aqueous solutions, Pergamon Press 1966, CCC No. 65-11670 TMS: Hydrometallurgy – a short course, 1973 G.M. Ritcey, A.W. Ashbrook: Solvent Extraction, Part I + II, Elsevier 1984 (I), 1979 (II), ISBN 0-444-41770-2 (I), ISBN 0-444-41771-0 (II) Michael L. Free: Hydrometallurgy, 2nd edition, 21.2.2021, 978-3-030-88086-6, TMS series A.R. Burkin: Chemical Hydrometallurgy, ICP, 2001, 978-1-86094-184-9 M. Shamsuddin: Physical Chemistry of Metallurgical Processes, 10.2.2016, 978-1-119-07832-6 Seshadri Seetharaman: Treatise on Process Metallurgy, 3-Volume Set, 1st Edition - December 23, 2013, ISBN: 9780080969510 Roderick Guthrie, Seshadri Seetharaman, Alexander McLean, Sridhar Seetharaman, H. Y. Sohn: Treatise on Process Metallurgy, Volume 4, Industrial Plant Design and Process Modeling, 2nd Edition - June 3, 2024, ISBN: 9780323854801, eBook ISBN: 9780323854818		
Types of Teaching:	S1 (SS): Lectures (3 SWS)		

	S1 (SS): Exercises (1 SWS) S1 (SS): Practical Application (1 SWS)
Pre-requisites:	**Recommendations:** Knowledge from the modules “General, Inorganic and Organic Chemistry” and “Fundamentals of Physical Chemistry”.
Frequency:	yearly in the summer semester
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 11 students or more) [MP minimum 30 min / KA 60 min] PVL: Lab PVL have to be satisfied before the examination.
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 11 und mehr Teilnehmern) [MP mindestens 30 min / KA 60 min] PVL: Lab PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.
Credit Points:	6
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]
Workload:	The workload is 180h. It is the result of 75h attendance and 105h self-studies. The latter includes the follow-up of the course and the preparation for the exam.

Data:	INAM. MA. / Examination number: 60913	Version: 14.01.2022	Start Year: SoSe 2022
Module Name:	**Innovation Analysis and Management**		
(English):			
Responsible:	Wiens, Marcus / Prof. Dr.		
Lecturer(s):	Wiens, Marcus / Prof. Dr.		
Institute(s):	Professor of Innovation and Risk Management		
Duration:	1 Semester(s)		
Competencies:	After successful completion of the module, students should be able to explain the drivers and dynamics of innovation and to determine the value of innovation-driven investments. Students should be able to model innovation processes based on extreme value theory and learning theories. Furthermore, they shold be able to apply behavioral and game-theoretic approaches explaining incentives for cooperative research & development, innovation networks, patent-races and contracting.		
Contents:	The module starts with a systematic overview of invention and innovation, providing basic economic knowledge about the sources, drivers and barriers for innovation. Selected practical examples and case studies shed light on particularly innovative industries. The module covers behavioral and strategic implications of innovation-oriented investments and analyses in depth issues like learning strategies, strategic cooperation and innovation networks and tournaments. Finally, the module derives conclusions for efficient innovation policies, from both a business and public perspective.		
Literature:	Uzunidis, D. et al. (ed.) (2021): Innovation Economics, Engineering and Management Handbook 2, Wiley & Sons. Hall, B. H. & Rosenberg, N. (2010): Handbook of the Economics of Innovation, Elsevier. Goyal, S. (2007): Connections – An Introduction to the Economics of Networks, Princeton University Press.		
Types of Teaching:	S1 (SS): Lectures (2 SWS) S1 (SS): Exercises (2 SWS)		
Pre-requisites:			
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	6		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 180h. It is the result of 60h attendance and 120h self-studies.		

Data:	INONF PM.MA.Nr. / Examination number: 52604	Version: 05.09.2022	Start Year: SoSe 2023
Module Name:	**Introduction to Nonferrous Metallurgical Processing**		
(English):			
Responsible:	Charitos, Alexandros / Prof.		
Lecturer(s):	Charitos, Alexandros / Prof.		
Institute(s):	Institute of Nonferrous Metallurgy and Purest Materials		
Duration:	1 Semester(s)		
Competencies:	Students will be introduced to fundamentals and applications within all areas of nonferrous metallurgy, i.e., pyrometallurgy, hydrometallurgy and electrometallurgy. Hence, the role of thermodynamics will be clearly explained and linked to unit operations pertinent to non-ferrous metallurgy. The course aims to provide a first impression with regard to nonferrous metallurgical processes, principles and associated unit operations, while providing a basis for further study of the above topics within further subjects. Students will be able to understand the fundamentals and applications within all areas of nonferrous metallurgy and to apply basic aspects.		
Contents:	An overview of thermodynamics will be presented focusing on Ellingham-, binary and ternary phase diagram use in the context of pyrometallurgical processing. Smelting and refining aggregates and their operation will be presented. A brief introduction to hydrometallurgy includes the use of Pourbaix E-ph diagrams, explanation of leaching types and the principles of operation of further units such as ion exchange, solvent extraction and precipitation among others. Electrometallurgical principles will be presented (e.g. the role of the electrochemical series) in the context of both electrorefining and electrowinning, while distinguishing between aqueous and molten salt electrolysis.		
Literature:	- Langer B.E. Understanding Non-ferrous Metals (incl. chemical compounds) 2022 - Gaskell, D.R., Laughlin, D.E. Introduction to the thermodynamics of materials, 6th Edition, CRC Press 2017 - Schlesinger, M.E., King M.J., Sole, K.C., Davenport W.G.: Extractive Metallurgy of Copper, Elsevier 2011 - Vignes A., Extractive Metallurgy, WILEY VCH 2011		
Types of Teaching:	S1 (SS): Lectures (3 SWS) S1 (SS): Exercises (1 SWS)		
Pre-requisites:			
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 150h. It is the result of 60h attendance and 90h self-studies.		

Data:	MTMP. MA. Nr. 3565 / Examination number: 9900	Version: 18.10.2024	Start Year: WiSe 2024
Module Name:	**Master Thesis (Metallic Materials Technology)**		
(English):			
Responsible:	Volkova, Olena / Prof. Dr.-Ing. Prahl, Ulrich / Prof. Dr.-Ing. Charitos, Alexandros / Prof. Szucki, Michał / Prof. Dr.-Ing.		
Lecturer(s):			
Institute(s):	Institute of Iron and Steel Technology Institute of Metal Forming Institute of Nonferrous Metallurgy and Purest Materials Foundry Institute		
Duration:	6 Month(s)		
Competencies:	The students are able, within a prescribed period, to independently process a defined complex problem from their field with appropriate scientific methods and to present both the problem and their own work in writing and orally. They are able to manage complex technical projects, taking responsibility for decision-making in unpredictable study contexts.		
Contents:			
Literature:			
Types of Teaching:	S1: Thesis (6 Mon)		
Pre-requisites:	**Mandatory:** - Absolvierung eines 12-wöchigen Industriepraktikums. (Completion of a 12-week industrial internship.) - Erfolgreiches Absolvieren des Moduls "Research Seminar" (Successful completion of the module "Research Seminar") - Bis auf ein Modul Abschluss aller anderen Module. (All modules have to be passed, expect of one module.)		
Frequency:	constantly		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: AP*: Written thesis MP*: Oral defense on the topic of the written thesis [20 to 60 min] * In modules requiring more than one exam, this exam has to be passed or completed with at least "ausreichend" (4,0), respectively.		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: AP*: Masterarbeit MP*: Kolloquium [20 bis 60 min] * Bei Modulen mit mehreren Prüfungsleistungen muss diese Prüfungsleistung bestanden bzw. mit mindestens "ausreichend" (4,0) bewertet sein.		
Credit Points:	30		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): AP*: Written thesis [w: 2] MP*: Oral defense on the topic of the written thesis [w: 1] * In modules requiring more than one exam, this exam has to be passed or completed with at least "ausreichend" (4,0), respectively.		
Workload:	The workload is 900h. It is the result of 0h attendance and 900h self-		

	studies.

Data:	MDP. MA. Nr. / Examination number: 50331	Version: 27.06.2022	Start Year: WiSe 2023
Module Name:	**Material Behaviour in Deformation Processes**		
(English):			
Responsible:	Prahl, Ulrich / Prof. Dr.-Ing.		
Lecturer(s):	Prahl, Ulrich / Prof. Dr.-Ing.		
Institute(s):	Institute of Metal Forming		
Duration:	1 Semester(s)		
Competencies:	Students understand the complex relationships between the material and process-related influences on the forming behaviour. Furthermore students are enabled to understand and evaluate the behaviour of relevant metallic materials in industrial manufacturing processes of forming technology. The forming behaviour of different metallic materials (e.g. iron/steel, magnesium, titanium, aluminium, nickel, shape memory alloys, etc.) is estimated on the basis of information on the chemical composition, manufacturing route and material condition. On the basis of the various semi-finished product production routes, the forming capacity of the individual materials is assessed with the aid of the metal physical properties relevant to forming. The extraction, further processing and application examples are discussed in an overview.		
Contents:	The main parameters influencing the forming behaviour of metallic materials are presented. State diagrams of binary and ternary alloys are presented for iron and common non-ferrous metals individually or in combination of alloying and accompanying elements. The information to be derived from them about the phase composition at different temperatures is explained and related to the forming behaviour depending on the forming conditions. Examples of flow curves and the forming capacity for selected materials and their different states underpin these relationships. Finally, the knowledge is brought into connection with cold and hot forming processes and the resulting requirements regarding the forming behaviour of the input materials or materials used. In seminars and practical courses, the knowledge is deepened and basic skills for determining material parameters relevant to forming are also taught.		
Literature:	Gottstein, Günter: Physical foundations of materials science. Springer, 2013		
Types of Teaching:	S1 (WS): Lectures (3 SWS)		
Pre-requisites:			
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 6 students or more) [MP minimum 30 min / KA 90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 6 und mehr Teilnehmern) [MP mindestens 30 min / KA 90 min]		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 150h. Letzteres umfasst die Vorlesungsbegleitung, Praktikums- und die Prüfungsvorbereitung.		

Data:	Examination number: 50120	Version: 11.06.2024	Start Year: SoSe 2025
Module Name:	**Materials Science and Mechanical Properties of Metals**		
(English):			
Responsible:	Biermann, Horst / Prof. Dr.-Ing. habil Leineweber, Andreas / Prof. Dr. rer. nat. habil.		
Lecturer(s):	Weidner, Anja / Dr.-Ing. habil. Martin, Stefan / Dr.-Ing.		
Institute(s):	Institute of Materials Engineering Institute of Materials Science		
Duration:	1 Semester(s)		
Competencies:	The student is able to relate problems from engineering practice to fundamental concepts from Materials Science. Further the student is able to relate technological aspects of processing of metallic materials to changes in microstructure, the mechanical parameters and further properties.		
Contents:	The first part of the lectures deals with the basics of materials science (structure, classes of materials), the main properties and the application of materials. The second part of the lecture deals with the (micro-)structure - properties relations of metallic materials. Focus is given to plastic deformation and failure, particularly to following metal alloy types: • Ferrous metals (plain carbon steels, high-alloyed steels, cast irons); • Non-ferrous metals (e.g. copper, nickel) • Light metals (aluminum, titanium, magnesium) • High-temperature alloys (superalloys, intermetallic alloys)		
Literature:	Askeland, D.R., The Science and Engineering of Materials, Chapman and Hall, London etc.Schatt, W.; Worch, H., Werkstoffwissenschaft, Deutscher Verlag für Grundstoffindustrie.W. D. Callister, jr. Materials Science and Engineering – An Introduction, New York etc.: John Wiley & Sons. Inc. M. F. Ashby, D.R.H. Jones, Engineering materials 2, 2nd ed., Butterworth-Heinemann, Oxford, 1998 James F. Shackelford, Introduction to Materials Science for Engineers, 7th ed. Addison Wesley., 2009		
Types of Teaching:	S1 (SS): Lectures (4 SWS) S1 (SS): Exercises (1 SWS)		
Pre-requisites:	**Recommendations:** Basic fundamentals of physics, chemistry and solid materials		
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [120 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [120 min]		
Credit Points:	7		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 210h. It is the result of 75h attendance and 135h self-studies.		

Data:	WERKMEC. BA. Nr. 253 / Examination number: 41906	Version: 12.08.2024	Start Year: WiSe 2018
Module Name:	**Mechanics of Materials**		
(English):			
Responsible:	Eidel, Bernhard / Prof. Dr.-Ing. habil.		
Lecturer(s):	Eidel, Bernhard / Prof. Dr.-Ing. habil.		
Institute(s):	Institute of Mechanics and Fluid Dynamics		
Duration:	1 Semester(s)		
Competencies:	Development of an understanding of the deformation behavior and failure mechanisms of engineering materials; students will get familiar with elastic, plastic, viscous, viscoelastic and viscoplastic behaviors of materials; students learn to apply tensor algebra as the language of continuum mechanics.		
Contents:	Most important ingredients are: • vector and tensor algebra • continuum mechanics foundations of stress, strain and displacements • rheological models for elastic, plastic, viscous, viscoelastic, and viscoplastic deformation behavior • time integration algorithms for the inelastic constitutive laws • multi-axial continuum laws for anisotropic elasticity and plasticity, extended strength and failure theories / criteria for multiaxial loading		
Literature:	J. Lemaitre and J.-L. Chaboche: Mechanics of Solid Materials, Cambridge University Press,2000		
Types of Teaching:	S1 (WS): Lectures (2 SWS) S1 (WS): Exercises (2 SWS)		
Pre-requisites:	**Recommendations:** Basic knowledge in engineering mechanics		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [120 min] PVL: Home work assignments PVL have to be satisfied before the examination.		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [120 min] PVL: Hausarbeit PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 150h. It is the result of 60h attendance and 90h self-studies.		

Data:	MTF. MA. Nr. 3563 / Examination number: 50225	Version: 21.02.2022	Start Year: WiSe 2023
Module Name:	**Melting Technology in Foundries**		
(English):			
Responsible:	Wolf, Gotthard / Prof. Dr.-Ing.		
Lecturer(s):	Dommaschk, Claudia / Dr.-Ing. Keßler, Andreas / Dr.-Ing.		
Institute(s):	Foundry Institute		
Duration:	1 Semester(s)		
Competencies:	- Acquirement of knowledge of ferrous and nonferrous alloys in views of heat treatment and metallurgy of melt - Students are able to apply the knowledge in the working life.		
Contents:	Metallurgy of cast iron, cast steel and nonferrous alloys; Design and function of melting furnaces; Melt treatment of ductile iron; melt treatment and degasing of aluminium alloys; Quality inspection of melts; Metallurgical caused casting defects		
Literature:	J. Campbell: Castings. Butterworth-Heinemann, 1991		
Types of Teaching:	S1 (WS): Lectures (3 SWS)		
Pre-requisites:			
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 150h. It is the result of 45h attendance and 105h self-studies.		

Data:	MCT. MA. Nr. 3567 / Examination number: 50227	Version: 21.02.2022	Start Year: WiSe 2023
Module Name:	**Moulding and Core Technology**		
(English):			
Responsible:	Wolf, Gotthard / Prof. Dr.-Ing.		
Lecturer(s):	Weider, Marco / Dr.-Ing.		
Institute(s):	Foundry Institute		
Duration:	1 Semester(s)		
Competencies:	- Knowledge of selection of forming methods depending on range of production in foundries - Competence to optimise the mould and core production in views of economy, quality and ecology		
Contents:	Basics of moulding technology, components of moulding materials, moulding machines for green sand and chemical bounded sand; Bentonite and chemical components for moulds;Chemical components for cores; Regeneration of green sand, chemical bounded sands and cores, secondary use of residuals; Casting defects caused by moulds and cores; Computer simulation of core production		
Literature:	Campbell, J.: Complete Casting. Butterworth-Heinemann, 2011 Polzin, H.: Inorganic Binders. Schiele & Schön, 2014		
Types of Teaching:	S1 (WS): Lectures (3 SWS)		
Pre-requisites:			
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 150h. It is the result of 45h attendance and 105h self-studies.		

Data:	NMFP. MA. Nr. / Examination number: 52701	Version: 18.01.2021	Start Year: SoSe 2021
Module Name:	**Numerical Modeling of Foundry Processes**		
(English):			
Responsible:	Szucki, Michał / Prof. Dr.-Ing.		
Lecturer(s):	Szucki, Michał / Prof. Dr.-Ing.		
Institute(s):	Foundry Institute		
Duration:	1 Semester(s)		
Competencies:	The students get to know various simulation tools from the field of foundry engineering. They will be able to apply the tools accordingly in order to optimise the production process and improve the casting quality. Students will get familiar with: a physical and mathematical description of foundry processes; basics of numerical methods; micro and macro modeling of the solidification process of casting alloys; CFD approach in foundry engineering; review of commercial simulation systems for casting production.		
Contents:	Introduction to modeling and simulations of foundry processes; physico-mathematical description of thermal processes; modeling the liquid metal flow; uniqueness conditions; modeling of the solidification process; finite difference method (FDM) and finite element method (FEM) in the modeling of foundry processes.		
Literature:	J. Hattel (Editor): Fundamentals of Numerical Modelling of Casting Processes, Polyteknisk Forlag, 2005 B. Mochnacki, J.S. Suchy: Numerical methods in computations of foundry processes, Polish Foundrymen's Technical Association, 1995 W.H. Press, S.A. Teukolsky, W.T. Vetterling, B.P. Flannery: Numerical recipes in C. The Art of Scientific Computation, Cambridge University Press, 2007 J. Zhu (Editor): Computational Simulations and Applications, IntechOpen, 2011		
Types of Teaching:	S1 (SS): Lectures (3 SWS) S1 (SS): Exercises (1 SWS)		
Pre-requisites:	**Recommendations:** Basics in Physics		
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 6 students or more) [MP minimum 20 min / KA 90 min] Oral examination as a group examination (20 minutes per participant)		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 6 und mehr Teilnehmern) [MP mindestens 20 min / KA 90 min] Mündliche Prüfung als Gruppenprüfung (20 Minuten pro Teilnehmer)		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 150h. It is the result of 60h attendance and 90h self-studies.		

Data:	SMF. MA. Nr. 3570 / Examination number: 50321	Version: 27.06.2022	Start Year: SoSe 2024
Module Name:	**Numerical Simulation in Metal Forming**		
(English):			
Responsible:	Prahl, Ulrich / Prof. Dr.-Ing.		
Lecturer(s):	Prahl, Ulrich / Prof. Dr.-Ing.		
Institute(s):	Institute of Metal Forming		
Duration:	1 Semester(s)		
Competencies:	Ability to independently simulate and design process chains considering interdependency between material conditions, production technology and property development in every production step.		
Contents:	• Basics in dimensional analyses • Modelling concepts and simulation methods • Numerical Simulation of forming processes (massive forming, sheet metal forming, semi-finished products) • Analyses of process data		
Literature:	• J.G. Lenard, M. Pietrzyk, L. Cser, Mathematical and physical simulation of the properties of hot rolled products, 1. ed, Elsevier, Amsterdam [u.a.] York, 1999. • M.A. Bhatti, Advanced topics in finite element analysis of structures: with Mathematica and MATLAB computations, John Wiley, Hoboken, N.J, 2006. • S. Kobayashi, S. Oh, T. Altan, A. Chaudhary, Metal forming and the finite-element method, J. Mater. Shap. Technol. 8 (1990) 65–65. doi: 10.1007/BF02834794.		
Types of Teaching:	S1 (SS): Lectures (3 SWS) S1 (SS): Exercises (1 SWS)		
Pre-requisites:			
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 6 students or more) [MP minimum 30 min / KA 90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 6 und mehr Teilnehmern) [MP mindestens 30 min / KA 90 min]		
Credit Points:	6		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 180h. It is the result of 60h attendance and 120h self-studies.		

Data:	OPMAN. MA. Nr. 2970 / Examination number: 61304	Version: 06.07.2015	Start Year: WiSe 2016
Module Name:	**Operations Management**		
(English):			
Responsible:	Höck, Michael / Prof. Dr.		
Lecturer(s):	Höck, Michael / Prof. Dr.		
Institute(s):	Professor of Industrial Management, Production Management and Logistics		
Duration:	1 Semester(s)		
Competencies:	Foremost, the module aims to convey to the student problem-solving competencies with a view to putting the student in a position to analyse the complex questions in operations management, to structure them, and to develop solution alternatives.		
Contents:	This course addresses the management of operations in manufacturing and service firms. Diverse activities, such as determining the size and type of production process, purchasing the appropriate raw materials, planning and scheduling the flow of materials and the nature and content of inventories, assuring product quality, and deciding on the production hardware and how it gets used, comprise this function of the company. Managing operations well requires both strategic and tactical skills. During the term, we will consider such topics as: process analysis, workforce issues, materials management, quality and productivity, technology, and strategic planning, together with relevant analytical techniques. This course will provide a survey of these issues.		
Literature:	Davis, M. & Heineke, J. (2005): Operations Management, 5/e, McGraw-Hill Cachon & Terwiesch (2006): Matching Supply and Demand, McGraw-Hill Stevenson (2007): Operations Management, 9/e, McGraw-Hill.		
Types of Teaching:	S1 (WS): Lectures (2 SWS) S1 (WS): Exercises (2 SWS)		
Pre-requisites:	**Recommendations:** None		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min] PVL: Case Studies PVL have to be satisfied before the examination.		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min] PVL: Fallstudien PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.		
Credit Points:	6		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 180h. It is the result of 60h attendance and 120h self-studies. Self-study consists of preparation and review of the lectures, independent work on case studies, as well as preparation for the written test.		

Data:	PRIMA. BA. / Examination number: 60916	Version: 14.01.2022	Start Year: SoSe 2022
Module Name:	**Project Risk Management**		
(English):			
Responsible:	Wiens, Marcus / Prof. Dr.		
Lecturer(s):	Wiens, Marcus / Prof. Dr.		
Institute(s):	Professor of Innovation and Risk Management		
Duration:	1 Semester(s)		
Competencies:	After successful completion of the module, students should be able to explain the context, rationale, strategy and tactics of project management with emphasis on the importance of project planning and project risk management by identifying and examining critical project phases and conditions. The course enables the participants to apply project management skills to projects in a variety of industries and disciplines with a strong focus on the complexities and problem constellations of mega projects, but also information technology, procurement & maintenance projects. By focussing on providing knowledge in core areas of risk analysis, time, cost and quality, the participants are able to confidently deal with the ever growing complexities and challenges of project management.		
Contents:	The module starts with a systematic overview of the principles of project management. The module covers the areas of project scope management, time management and resource scheduling as well as cost & quality management primarily from a risk-oriented perspective. The module applies methods such as model-based and statistical risk analysis, decision-theoretic analyses, Monte-Carlo-simulations as well as behavioral and game-theoretic approaches to understand incentives, decision biases and public acceptance. Finally, the module derives conclusions for efficient risk management policies for complex projects.		
Literature:	Charrel, P.-J. & Galarreta, D. (ed.) (2007): Project Management and Risk Management in Complex Projects, Springer. Munier, N. (2014): Risk Management for Engineering Projects, Springer. Wiens, M. & Schultmann, F. (2022): Precarious Projects – Case Studies and Solutions for High Risk Projects, KIT-Publishing.		
Types of Teaching:	S1 (SS): Lectures (2 SWS) S1 (SS): Exercises (2 SWS)		
Pre-requisites:			
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	6		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 180h. It is the result of 60h attendance and 120h self-studies.		

Data:	RNEM .MA .Nr / Examination number: 52803	Version: 14.07.2022	Start Year: SoSe 2024
Module Name:	**Recycling of Non-ferrous Metals**		
(English):			
Responsible:	Scharf, Christiane / Prof. Dr.-Ing.		
Lecturer(s):	Scharf, Christiane / Prof. Dr.-Ing.		
Institute(s):	Institute of Nonferrous Metallurgy and Purest Materials		
Duration:	1 Semester(s)		
Competencies:	Learn, apply, and deepen metallurgical knowledge and skills in solving metallurgical engineering recycling challenges. Upon completion of the module, students will be able to understand and assess metallurgical recycling processes.		
Contents:	• General information (including life cycle assessment) for Cu, Zn, Pb, Al, Mg, steel and in comparison • Scrap (including types, sources from applications, collection, classification, scrap volume in figures, recycling rates) • Processes incl. process engineering (e.g. sorting, metallurgical preparation and processing and reprocessing, induction, flame shaft and rotary drum furnaces) • Thermodynamics for the remelting of scrap (including reactions in the aggregates, also with additives such as molten salts and/or shielding gases) • Consideration of the exhaust side • Calculations for oxide/salt fractions • Ecological aspects • Energy demand, consumption		
Literature:	• Slag atlas, Pourbaix diagrams • David R. Lide, Handbook of Chemistry and Physics, CRC Press, 1997 • Donals L. Stewart, Jr.; James C. Daley; Robert L. Stephens – Recycling of metals and engineered materials, TMS, 2000		
Types of Teaching:	S1 (SS): Lectures (4 SWS) S1 (SS): Exercises (2 SWS)		
Pre-requisites:	**Recommendations:** Basics of Hydro- and Pyrometallurgy		
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 11 students or more) [MP minimum 45 min / KA 120 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 11 und mehr Teilnehmern) [MP mindestens 45 min / KA 120 min]		
Credit Points:	8		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 240h. It is the result of 90h attendance and 150h self-studies.		

Data:	RSMMT MA: Nr. / Examination number: 59907	Version: 21.01.2022	Start Year: SoSe 2024
Module Name:	**Research Seminar (Metallic Materials Technology)**		
(English):			
Responsible:	Volkova, Olena / Prof. Dr.-Ing. Wolf, Gotthard / Prof. Dr.-Ing. Prahl, Ulrich / Prof. Dr.-Ing. Charitos, Alexandros / Prof.		
Lecturer(s):	Ullmann, Madlen / Dr.-Ing.		
Institute(s):	Institute of Metal Forming Institute of Iron and Steel Technology Foundry Institute Institute of Nonferrous Metallurgy and Purest Materials		
Duration:	1 Semester(s)		
Competencies:	Upon successful completion of the module, the students will have knowledge in: using databases for literature and patent surveys, applying reference management software, selecting topic related key literature, evaluating and interpreting of scientific literature and patents, presenting scientific contents oral, graphically, and written. This knowledge enables the students to independently develop an approach of solving engineering problems and present relevant findings.		
Contents:	• Attending the seminar • Literature research and review on given seminar topic • individual and independent preparation of given tasks (written literature review, presentation, data analysis)		
Literature:	seminar specific		
Types of Teaching:	S1 (SS): Lectures (1 SWS) S1 (SS): Seminar (2 SWS)		
Pre-requisites:			
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: AP: Literature Report		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: AP: Literaturarbeit		
Credit Points:	4		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): AP: Literature Report [w: 1]		
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies.		

Data:	STSSP. MA. Nr. 3218 / Examination number: 42604	Version: 13.07.2016	Start Year: SoSe 2012
Module Name:	**Selected Topics of Solid State Physics**		
(English):			
Responsible:	Rafaja, David / Prof. Dr. rer. nat. habil.		
Lecturer(s):	Rafaja, David / Prof. Dr. rer. nat. habil.		
Institute(s):	Institute of Materials Science		
Duration:	1 Semester(s)		
Competencies:	Basic principles of solid state physics, correlation between the crystal structure, real structure and the electronic, magnetic, optical and thermal properties of solids. Absolving the course, the students should be able to recognise the effect of the structure on materials properties and to apply their knowledge in materials design		
Contents:	Drude model of electrical conductivity; temperature dependence of electrical resistivity in metals and semiconductors; Schottky contact; p-n contact; superconductivity (Landau theory); magnetic susceptibility; dia-, para-, ferro-, antiferro- and ferrimagnetism; optical properties of solids; complex index of refraction; dispersion curves for systems with free and bound electrons; Kramers-Kronig relationship; colour of metals; optical theory of reflection for multilayer systems; thermal expansion; specific heat (Einstein and Debye models); heat conductivity		
Literature:	R.E. Hummel: Electronic properties of materials C. Kittel: Introduction in solid state physics		
Types of Teaching:	S1 (SS): Lectures (3 SWS)		
Pre-requisites:	**Recommendations:** Höhere Mathematik für Ingenieure 1, 2015-03-12 Fundamental of Microstructures, 2010-12-02 Höhere Mathematik für Ingenieure 2, 2015-03-12 Allgemeine, Anorganische und Organische Chemie, 2009-09-02 Einführung in die Kristallographie, 2009-10-14 Physik für Naturwissenschaftler I, 2012-05-10 Physik für Naturwissenschaftler II, 2012-05-10		
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 10 students or more) [MP minimum 30 min / KA 120 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 10 und mehr Teilnehmern) [MP mindestens 30 min / KA 120 min]		
Credit Points:	4		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies.		

Data:	STCMS. MA. Nr. 3586 / Examination number: 44506	Version: 16.07.2024	Start Year: WiSe 2025
Module Name:	**Software Tools for Computational Materials Scientists**		
(English):			
Responsible:	Eidel, Bernhard / Prof. Dr.-Ing. habil.		
Lecturer(s):	Prakash, Aruna / Dr.-Ing.		
Institute(s):	Institute of Mechanics and Fluid Dynamics		
Duration:	1 Semester(s)		
Competencies:	The students will learn the basics of the Linux operating system and how to interact through the shell with the computer, in particular with the file system. Students achieve competencies on how to set up a work environment for their needs, how to monitor system resources and to connect securely to remote computers. Moreover, they are trained to apply shell programming and advanced tools for usage with the shell. Participants will learn and understand elements and techniques of the Python programming language and are empowered to carry out structured software development using the language. This includes basic design patterns, data structures, object-oriented programming, file handling, among others. Students obtain competencies to write code for scientific computing using specific packages and features for the purpose and to carry out scientific visualizations. Finally, participants will be able to operate version control systems for working in a collaborative fashion.		
Contents:	The course is divided into two parts: In the first part, students learn to communicate with the computer through the Linux operating system including its tools, whilst in the second part they learn the Python programming language and aspects of scientific programming with this language. Subsequently, version control systems for collaborative working and usage of repositories will be introduced. Additionally, aspects of software testing and nuances pertaining to visualization of scientific data will be outlined.		
Literature:	https://www.tldp.org/LDP/intro-linux/intro-linux.pdf https://python.org https://numpy.org https://matplotlib.org https://gitref.org		
Types of Teaching:	S1 (WS): Lectures (2 SWS) S1 (WS): Exercises (2 SWS)		
Pre-requisites:			
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 8 students or more) [MP minimum 30 min / KA 120 min] PVL: Programming project PVL have to be satisfied before the examination.		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 8 und mehr Teilnehmern) [MP mindestens 30 min / KA 120 min] PVL: Programmierprojekt PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following		

	weights (w): MP/KA [w: 1]
Workload:	The workload is 150h. It is the result of 60h attendance and 90h self-studies.

Data:	SPST. MA. Nr. 3568 / Examination number: 50927	Version: 17.06.2019	Start Year: SoSe 2018
Module Name:	**Special Steel Technology**		
(English):			
Responsible:	Volkova, Olena / Prof. Dr.-Ing.		
Lecturer(s):	Volkova, Olena / Prof. Dr.-Ing.		
Institute(s):	Institute of Iron and Steel Technology		
Duration:	1 Semester(s)		
Competencies:	Upon successful completion of the module, the students will have in-depth knowledge of the equipment and technology of steel casting and special steel treatment processes. This knowledge enables the students to independently solve engineering problems of relevance.		
Contents:	Secondary Steelmaking, Alloying, Mixing, Gas Stirring, Deoxidation, Desulfurization, Degassing, Hydrogen and Nitrogen, Decarburization, Dephosphorization, Reoxidation, Vacuum Methods, Heating, Chemical Heating, Ladle Furnace, Heat Balance During Ladle Charge, Non-Metallic Inclusions, Control of the Composition of Nonmetallic Inclusions, Removal of Non-Metallic Inclusions, Slag Management, AOD Process for Stainless Steel, Electro Slag Remelting, Slag, Fundamentals of Solidification, Ingot Casting of Steel, Continuous Casting of Steel, Mold, Mold Fluxes, Heat Transfer in the Mold, Tundish, Non-Metallic Inclusions Behavior during Continuous Casting, Near Net Shape Casting		
Literature:	• F. Oeters, Metallurgy of steelmaking, Verlag Stahleisen GmbH, Berlin 1994 • G. Stolte, Secondary Metallurgy, Verlag Stahleisen GmbH, Düsseldorf 2002 • S. Seetharaman, TREATISE ON PROCESS METALLURGY, Volume 3: Industrial Processes, Part A, Elsevier, 2014		
Types of Teaching:	S1 (SS): Lectures (3 SWS) S1 (SS): Seminar (1 SWS)		
Pre-requisites:	**Recommendations:** Knowledge in chemistry, natural science or other relevant areas.		
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	6		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 180h. It is the result of 60h attendance and 120h self-studies.		

Data:	STADS MA. 3221 / Examination number: 12306	Version: 27.04.2026	Start Year: WiSe 2026
Module Name:	**Statistical Foundations of Data Science**		
(English):	Statistical Foundations of Data Science		
Responsible:	Sprungk, Björn / Prof. Dr.		
Lecturer(s):	Sprungk, Björn / Prof. Dr.		
Institute(s):	Institute of Stochastics		
Duration:	1 Semester(s)		
Competencies:	Students understand fundamental concepts of probability, can translate real-world problems into probabilistic models, and make probabilistic predictions. They are able to describe and interpret key statistical quantities and apply core statistical methods to analyze data. Furthermore, they understand statistical models and can critically apply methods of statistical inference using scientific software.		
Contents:	• Fundamentals of probability theory (e.g., random variables, conditioning, distributions, limit theorems) • Descriptive statistics (empirical characteristics and statistical graphics) • Statistical inference (parameter estimation, hypothesis testing) • Linear models and regression analysis		
Literature:	• D. Montgomery, G. C. Runger: *Introduction to Probability and Statistics for Data Science*. Cambridge University Press, 2025. • S. Ross: *A First Course in Probability*, Pearson, 2019. • M. Kaptein , E. van den Heuvel: *Statistics for Data Scientists*, Springer, 2022		
Types of Teaching:	S1 (WS): Lectures (2 SWS) S1 (WS): Exercises (1 SWS)		
Pre-requisites:			
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA: Written exam [120 min] PVL: Programming Project PVL have to be satisfied before the examination.		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA: Klausur [120 min] PVL: Programmierprojekt PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA: Written exam [w: 1]		
Workload:	The workload is 150h. It is the result of 45h attendance and 105h self-studies.		

Data:	ST MA. Nr. 3600 / Examination number: 50932	Version: 17.06.2019	Start Year: SoSe 2019
Module Name:	**Steel Application**		
(English):			
Responsible:	Volkova, Olena / Prof. Dr.-Ing.		
Lecturer(s):	Wendler, Marco / Dr.-Ing.		
Institute(s):	Institute of Iron and Steel Technology		
Duration:	1 Semester(s)		
Competencies:	The students acquire the knowledge of the application-related properties, in particular mechanical properties, of steels. Upon successful completion of the module, the students are familiar with the criteria and considerations in the design of the chemical composition and thermomechanical processing for various structural and engineering applications. The student can apply their knowledge to select steels with a broad range of properties from soft formable steels to advanced high-strength steels for more demanding applications.		
Contents:	Classification of steels based on the application area, thermomechanical processing of the following classes of steels to adjust the required properties: formable sheet steels, engineering quenched and tempered steels, structural steels, pearlitic steels, surface-treated steels, tool steels, electrical steels, and high Mn steels		
Literature:	B.C. De Cooman, J. Speer, Fundamentals of Steel Product Physical Metallurgy, Assn. of Iron and Steel Engineers, 1st Ed., 2011. Werkstoffkunde Stahl, Volume 2: Application, Springer Verlag, 1985.		
Types of Teaching:	S1 (SS): Lectures (2 SWS) S1 (SS): Seminar (1 SWS)		
Pre-requisites:	**Recommendations:** Knowledge of the fundamentals of Materials Science and Engineering		
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	4		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies.		

Data:	SCM. MA. Nr. 937 / Examination number: 61305	Version: 06.07.2015	Start Year: SoSe 2016
Module Name:	**Supply Chain Management**		
(English):			
Responsible:	Höck, Michael / Prof. Dr.		
Lecturer(s):	Höck, Michael / Prof. Dr.		
Institute(s):	Professor of Industrial Management, Production Management and Logistics		
Duration:	1 Semester(s)		
Competencies:	In this course students will view the supply chain from the point of view of a general manager. Logistics and supply chain management is all about managing the hand-offs in a supply chain - hand-offs of either information or product. The design of a logistics system is critically linked to the objectives of the supply chain. Our goal in this course is to understand how logistical decisions impact the performance of the firm as well as the entire supply chain. The key will be to understand the link between supply chain structures and logistical capabilities in a firm or supply chain.		
Contents:	Supply Chain Management (SCM) deals with the planning, implementing and controlling of efficient flow and storage of raw materials, in-process inventory, finished goods, and related information from point of origin to point of consumption. Issues discussed in the course will include the total logistics cost approach, supply chain network design and optimizing the overall performance. Effective logistics systems aim towards coordination of transportation, inventory positioning and supply contracts to provide quick service efficiently.		
Literature:	Chopra, S.; Meindl, P. (2006): Supply Chain Management, 3rd Ed., Pearson Prentice Hall, New York. Cachon, G.; Terwiesch, C. (2006): Matching Supply with Demand, McGraw-Hill, Boston.		
Types of Teaching:	S1 (SS): Lectures (2 SWS) S1 (SS): Exercises (2 SWS)		
Pre-requisites:			
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min] PVL: Case Studies PVL have to be satisfied before the examination.		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min] PVL: Fallstudien PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.		
Credit Points:	6		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 180h. It is the result of 60h attendance and 120h self-studies. Letzteres umfasst Vor- und Nachbereitung der Vorlesungen, die selbständige Bearbeitung von Fallstudien sowie die Vorbereitung auf die Klausur.		

Data:	FFP. MA. Nr. / Examination number: 50333	Version: 12.08.2024	Start Year: WiSe 2025
Module Name:	**Technology of Flat Products**		
(English):			
Responsible:	Prahl, Ulrich / Prof. Dr.-Ing.		
Lecturer(s):	Ullmann, Madlen / Dr.-Ing. Prahl, Ulrich / Prof. Dr.-Ing.		
Institute(s):	Institute of Metal Forming		
Duration:	1 Semester(s)		
Competencies:	Profund transfer of knowledge for a material-specific development of technologies for the production of flat products as well as the ability to sketch the necessary plant concepts. That knowledge allows to choose the most economical way of production with the highest quality of the product. Students will be able to understand and to control qualitatively industrial technologies for the production of metallic flat products.		
Contents:	After a short repetition of technological methods, flat products will be specified according to their condition of delivery and application. Additionally, necessary manufacturing equipment will be introduced. Several plant components will be presented in terms of their ability to alter material properties. Material-specific knowledge for processes such as heating, hot forming (hardening and softening, precipitation and transformation behavior, microstructure), cooling, cold forming and heat treatment will be expanded to flat product specific contents.		
Literature:	Béranger: The Book of Steel, Lavoisier Publishing Inc. 1996		
Types of Teaching:	S1 (WS): Lectures (3 SWS) S1 (WS): Exercises (1 SWS)		
Pre-requisites:	**Recommendations:** Fundamentals of Metal Forming		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 6 students or more) [MP minimum 30 min / KA 90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 6 und mehr Teilnehmern) [MP mindestens 30 min / KA 90 min]		
Credit Points:	6		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 180h. It is the result of 60h attendance and 120h self-studies.		

Data:	TIS. MA. Nr. 3564 / Examination number: 50926	Version: 17.06.2019	Start Year: WiSe 2019
Module Name:	**Technology of Iron and Steel**		
(English):			
Responsible:	Volkova, Olena / Prof. Dr.-Ing.		
Lecturer(s):	Gutte, Heiner / Dr.		
Institute(s):	Institute of Iron and Steel Technology		
Duration:	1 Semester(s)		
Competencies:	Upon successful completion of the module, the students will have ready-to-use knowledge of the crude iron production, alternative technologies of iron- and steelmaking, and the chemical reactions involved. This knowledge enables the students to independently evaluate and solve application-oriented engineering problems.		
Contents:	Ironmaking, Ore Preparation, Coke, Blast Furnace Process, Blast Furnace Reactions, Injectants, Behavior of Minor Elements and Impurities, Formation of Hot Metal and Slag, Energy and Materials Balance of Blast Furnace, DRI Processes, Smelting Reduction Processes, New Developments of Ironmaking Technologies, Hot Metal Pretreatment, Converter Steelmaking, Process Phenomena in Converter Steelmaking, Slag Formation, Postcombustion, Reactions in Converter Process, Energy and Materials Balance of Converter Process, Electric Furnace Steelmaking, AC and DC Furnaces, Electrodes, Foaming Slag, Energy and Materials Balance of EAF Process, Special Furnace Constructions, Hybrid Process for Steelmaking of Scrap and Hot Metal, Secondary Steelmaking, Continuous Casting of Steel		
Literature:	• F. Oeters, Metallurgy of steelmaking, Verlag Stahleisen GmbH, Berlin 1994 • A. Babich, D. Senk, H.W. Gudenau, Ironmaking, Verlag Stahleisen GmbH, Duesseldorf, 2016 • S. Seetharaman, TREATISE ON PROCESS METALLURGY, Volume 3: Industrial Processes, Part A, Elsevier, 2014		
Types of Teaching:	S1 (WS): Lectures (2 SWS) S1 (WS): Seminar (1 SWS)		
Pre-requisites:	**Recommendations:** Knowledge in chemistry, natural science or other relevant areas.		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: KA [90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]		
Credit Points:	4		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): KA [w: 1]		
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies.		

Data:	TLP. MA. Nr. / Examination number: 50330	Version: 12.08.2024	Start Year: SoSe 2026
Module Name:	**Technology of Long Products**		
(English):			
Responsible:	Prahl, Ulrich / Prof. Dr.-Ing.		
Lecturer(s):	Ullmann, Madlen / Dr.-Ing. Prahl, Ulrich / Prof. Dr.-Ing.		
Institute(s):	Institute of Metal Forming		
Duration:	1 Semester(s)		
Competencies:	Profund transfer of knowledge for the development of material-specific technologies including plant concepts for producing hot rolled long products combined with quality and economic aspects. Different methods of thermomechanical treatment, specifics of important metals and alloys as well as their further processing to semi-finished products and finished products by cold forming will be addressed. Students will be able to understand and to control qualitatively industrial technologies for the production of metallic long products.		
Contents:	The components of a technological process chain will be demonstrated and their subject matter will be discussed. This includes material-specific knowledge (forming behavior, hardening and softening kinetics, phase transformation, precipitation, microstructure development at room temperature and the mechanical properties), quality characteristics of the products to be produced according to applicable standards and the plant design. The different methods of thermomechanical treatment will be covered for rolling of rods, wire and profiles. The necessary requirements on plant technology and the function of several units with its technical data will be discussed. This is followed by teaching product manufacturing methods from cast ingot to semi-finished product by hot and cold forming for selected metals and alloys.		
Literature:	Béranger: The Book of Steel, Lavoisier Publishing Inc. 1996		
Types of Teaching:	S1 (SS): Lectures (2 SWS) S1 (SS): Exercises (1 SWS)		
Pre-requisites:	**Recommendations:** Fundamentals of Metal Forming		
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 6 students or more) [MP minimum 30 min / KA 60 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 6 und mehr Teilnehmern) [MP mindestens 30 min / KA 60 min]		
Credit Points:	4		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies.		

Data:	TMEFO. MA. Nr. / Examination number: 50332	Version: 23.08.2022	Start Year: WiSe 2023
Module Name:	**Theory of Metal Forming**		
(English):			
Responsible:	Prahl, Ulrich / Prof. Dr.-Ing.		
Lecturer(s):	Prahl, Ulrich / Prof. Dr.-Ing.		
Institute(s):	Institute of Metal Forming		
Duration:	1 Semester(s)		
Competencies:	Students will be able to apply basic theoretical concepts of forming technology and transfer them to industrial problems, especially: • thermodynamic and continuum mechanical description of forming processes, • creation of phenomenological models for the description of forming and temperature temperature state • corresponding models for the description of the material state and the essential boundary conditions for the forming zone.		
Contents:	After a compact introduction to the tensor notation and tensor calculation, the continuum mechanical description of the deformation state in a solid body is given for large deformations. The kinematic, kinetic and constitutive equations are derived for the 3D space. The material-specific equations focus on the plastic and elasto-plastic models. One focus is on flow conditions and hardening approaches for monotonic and cyclic loads. The basics of forming-relevant model concepts of contact mechanics and tribology are derived. The acquired knowledge is applied to typical examples from forming technology during the lectures.		
Literature:	Pawelski, O: On the Application of Plasticity Theory for Developing Metal Forming and Testing Processes. Finite Inelastic Deformations—Theory and Applications. Springer, Berlin, Heidelberg, 1992. 471-482.		
Types of Teaching:	S1 (WS): Lectures (3 SWS)		
Pre-requisites:	**Recommendations:** Knowledge of the basics of materials science, basics of Materials technology, fundamentals of plastic metal forming		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 6 students or more) [MP minimum 30 min / KA 90 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 6 und mehr Teilnehmern) [MP mindestens 30 min / KA 90 min]		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 150h. It is the result of 45h attendance and 105h self-studies. Letzteres umfasst die Begleitung der Lehrveranstaltung und die Prüfungsvorbereitung.		

Data:	TM MA. Nr. / Examination number: 50934	Version: 08.07.2022	Start Year: WiSe 2022
Module Name:	**Thermochemical Modelling**		
(English):			
Responsible:	Volkova, Olena / Prof. Dr.-Ing.		
Lecturer(s):			
Institute(s):	Institute of Iron and Steel Technology		
Duration:	1 Semester(s)		
Competencies:	After successful completition of the module, the students are able to solve independently thermodynamic and thermochemical calculations with special software. The students are able to transfer it for solution of modelling tasks in the field of applied material technology.		
Contents:	Introduction to thermodynamic equilibrium calculation, reactions calculation, heat and mass balances, phase transformations, phase diagrams of steels and slags, introduction to software for thermochemical balance calculation (FactSage, HSC). The aim is the application of thermochemical modelling / simulation on the technical problems of steelmaking.		
Literature:			
Types of Teaching:	S1 (WS): Lectures (1 SWS) S1 (WS): Practical Application (2 SWS)		
Pre-requisites:	**Recommendations:** Special Steel Technology, 2019-06-17 Technology of Iron and Steel, 2019-06-17		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 13 students or more) [MP minimum 60 min / KA 60 min] In the case of oral examination: oral group discussion. The examination results are not rated.		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 13 und mehr Teilnehmern) [MP mindestens 60 min / KA 60 min] Bei MP: mündliches Gruppengespräch. Das Modul wird nicht benotet.		
Credit Points:	4		
Grade:	The examination results are not rated. The credits are given when the exams are passed successfully.		
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies. The time required is 90h and consists of 30h attendance time and 60h self-study time. The latter includes the pre- and follow-up of the courses and exam preparation.		

Data:	TMPCH. MA. Nr. / Examination number: 21209	Version: 07.09.2022	Start Year: SoSe 2023
Module Name:	**Thermodynamics of Materials and Chemical Principles**		
(English):			
Responsible:	Frisch, Gero / Prof. Dr. Leineweber, Andreas / Prof. Dr. rer. nat. habil.		
Lecturer(s):	Frisch, Gero / Prof. Dr. Fabrichnaya, Olga / Dr.		
Institute(s):	Institute of Inorganic Chemistry Institute of Materials Science		
Duration:	2 Semester(s)		
Competencies:	The students understand thermodynamic properties of materials and are able to apply calculation methods of phase diagrams. Students are able to predict and describe structure, properties and chemical behaviour of simple chemical compounds.		
Contents:	Most important topics are: Thermodynamic laws and quantities Thermodynamic properties of materials Calculation of complex equilibria in multiphase and multicomponent systems Optimization of phase diagrams Structure and bonding in chemical compounds Principles of chemical reactions and reactivity		
Literature:	Mats Hillert, “Phase equilibria, phase diagrams and phase transformations”, 2nd Ed., Cambridge (2009) Robert de Hoff, “Thermodynamics in Materials Science", 2nd Ed., Taylor & Francis (2006) Hans Leo Lukas, Suzana Fries, Bo Sundman, “Computational Thermodynamics, the CALPHAD method”, Cambridge (2007) Jeffrey Gaffney, Nancy Marley: "General Chemistry for Engineers", Elsevier (2018)		
Types of Teaching:	S1 (SS): Chemical Principles / Exercises (1 SWS) S2 (WS): Thermodynamics of Materials / Lectures (2 SWS)		
Pre-requisites:	**Recommendations:** Background in physical chemistry and materials science		
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA*: Thermodynamics of Materials (KA if 6 students or more) [MP minimum 30 min / KA 120 min] MP/KA*: Chemical Principles (KA if 6 students or more) [MP minimum 30 min / KA 90 min] * In modules requiring more than one exam, this exam has to be passed or completed with at least "ausreichend" (4,0), respectively.		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA*: Thermodynamics of Materials (KA bei 6 und mehr Teilnehmern) [MP mindestens 30 min / KA 120 min] MP/KA*: Chemical Principles (KA bei 6 und mehr Teilnehmern) [MP mindestens 30 min / KA 90 min] * Bei Modulen mit mehreren Prüfungsleistungen muss diese Prüfungsleistung bestanden bzw. mit mindestens "ausreichend" (4,0)		

	bewertet sein.
Credit Points:	4
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA*: Thermodynamics of Materials [w: 1] MP/KA*: Chemical Principles [w: 0] * In modules requiring more than one exam, this exam has to be passed or completed with at least "ausreichend" (4,0), respectively.
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies.

Data:	VRPCP. MA. Nr. / Examination number: 52702	Version: 18.01.2021	Start Year: WiSe 2021
Module Name:	**Virtual and Rapid Prototyping in Castings Production**		
(English):			
Responsible:	Szucki, Michał / Prof. Dr.-Ing.		
Lecturer(s):	Szucki, Michał / Prof. Dr.-Ing.		
Institute(s):	Foundry Institute		
Duration:	1 Semester(s)		
Competencies:	The students learn various methods from the field of foundry engineering in order to better understand the casting process and solidification. They will be able to apply the methods accordingly in order to be able to optimise the casting process. Students will get familiar with: Computer-aided techniques for designing casting technology; Casting life cycle simulations; Numerical approaches to production optimization; Virtual methods for casting quality control; Rapid prototyping methods		
Contents:	Introduction to virtual prototyping; mathematical optimization; overview of CAE systems used in foundry engineering; prediction of casting defects and their impact on the properties of the final product; validation of simulation results, data exchange between simulation systems; application of additive manufacturing methods in the production of castings.		
Literature:	S. Tichkiewitch, M. Tollenaere, P. Ray (Editors): Advances in Integrated Design and Manufacturing in Mechanical Engineering II, Springer, 2007 J. Hattel (Editor): Fundamentals of Numerical Modelling of Casting Processes, Polyteknisk Forlag, 2005 I. Hahn, J.C. Sturm: Autonomous optimization of casting processes and designs, World Foundry Congress, Hangzhou, China, October 16-20, 2010 P.K. Venuvinod, W. Ma: Rapid Prototyping, Springer, 2004		
Types of Teaching:	S1 (WS): Lectures (3 SWS)		
Pre-requisites:			
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 6 students or more) [MP minimum 20 min / KA 90 min] Oral examination as a group examination (20 minutes per participant)		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA (KA bei 6 und mehr Teilnehmern) [MP mindestens 20 min / KA 90 min] Mündliche Prüfung als Gruppenprüfung (20 Minuten pro Teilnehmer)		
Credit Points:	4		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies.		

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