Amtliche Bekanntmachungen der TU Bergakademie Freiberg

Nr. 14, Heft 2 vom 11. April 2022

Modulhandbuch

für den

Masterstudiengang

Metallic Materials Technology

Inhaltsverzeichnis

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:	AHTEM MA Nr. 3708 / Examination number: 52601	Version: 09.12.2021	Start Year: SoSe 2022
Module Name:	**Analysis of High Temperature Processes in Extractive Metallurgy**		
(English):			
Responsible:	Charitos, Alexandros / Prof.		
Lecturer(s):	Charitos, Alexandros / Prof.		
Institute(s):	Institute for 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-dynamics (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 (SS): Lectures (4 SWS) S1 (SS): Presentation of the assignment / Seminar (1 SWS)		
Pre-requisites:	**Recommendations:** Revision of courses associated to metallurgical thermodynamics		
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: 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.		

Data:	CPTA MA Nr. 3658 / Examination number: 44509	Version: 16.02.2022	Start Year: SoSe 2019
Module Name:	**Crystal Plasticity, Texture and Anisotropy**		
(English):	Crystal Plasticity, Texture and Anisotropy		
Responsible:	Eidel, Bernhard / Prof. Dr.-Ing. habil.		
Lecturer(s):	Prakash, Aruna / Dr.-Ing. Eidel, Bernhard / Prof. Dr.-Ing. habil.		
Institute(s):	Institute of Mechanics and Fluid Dynamics		
Duration:	1 Semester(s)		
Competencies:	Students will be exposed to the materials scientific fundamentals of plasticity in single and polycrystals. They will learn mathematical and conceptual concepts concerning orientation distributions, texture and anisotropy and will be able to apply this knowledge for understanding material properties. They will learn about experimental methods for synthesis of polycrystalline materials, for testing and characterization. Students will be introduced to different types of representing the particular deformation behaviour in polycrystalline materials, i.e., mean field and full field approaches. They will be able to understand positive and negative aspects of these models and can transfer their knowlege to new models. An other emphasis is on fundamental concepts of grain boundaries together with approaches towards modeling them. The students will get acquainted with various tools for data analysis and simulations and will be able to apply them to new problems.		
Contents:	• Mathematical concepts of orientation distributions, description and characterization of grain distributions • Texture: Definition, typical textures • Experimental methods for synthesis, testing and characterization • Basics of most commonly used crystal plasticity models • Grain boundaries, 5-parameter description, experimental and modeling aspects The above topics will be extended in the hands-on tutorial/exercise/programming sessions, where the emphasis will be on applying the methods learnt in the lecture.		
Literature:	1. Crystal Plasticity Finite Element Methods: In Materials Science and Engineering; F. Roters, P. Eisenlohr, T. Bieler and D. Raabe, 2010, Wiley Publishers 2. Texture and Anisotropy; U.F. Kocks, C. Tomé and H.-R. Wenk, 1998, Cambridge University Press 3. The measurement of grain boundary geometry; V. Randle, 1993, CRC Press 4. Texture Analysis in Materials Science, H.-J. Bunge, 1983, Elsevier 5. Grain Boundary and Crystalline Plasticity, L. Priester, 2013, Wiley Publishers		
Types of Teaching:	S1 (SS): Lectures (2 SWS) S1 (SS): Exercises (1 SWS)		
Pre-requisites:	**Recommendations:** Mechanics of Materials, 2022-02-16 Minimum requirements are scientific programming skills (as, e.g., aqcuired during "Software Tools for Computational Materials Scientists 1") and a basic understanding of plasticity (as, e.g., aqcuired from "Fundamentals of Microstructures").		
Frequency:	yearly in the summer semester		
Requirements for Credit	For the award of credit points it is necessary to pass the module exam.		

Points:	The module exam contains: PVL: Calculation and simulation MP/KA (KA if 6 students or more) [MP minimum 30 min / KA 90 min] PVL have to be satisfied before the examination.
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: PVL: Berechnungen und Simulation MP/KA (KA bei 6 und mehr Teilnehmern) [MP mindestens 30 min / KA 90 min] PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.
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. Der Zeitaufwand beträgt 150h und setzt sich zusammen aus 60h Präsenzzeit und 90h Selbststudium.

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: Erfolgreiche 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.		

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:	FPD. MA. Nr. 3566 / Examination number: 50226	Version: 23.02.2017	Start Year: SoSe 2017
Module Name:	**Foundry Process Design**		
(English):			
Responsible:	Wolf, Gotthard / Prof. Dr.-Ing.		
Lecturer(s):	Szucki, Michał / Prof. Dr.-Ing.		
Institute(s):	Foundry Institute		
Duration:	2 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) S2 (WS): 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:	FPD. MA. Nr. 3562 / Examination number: 50320	Version: 22.02.2017	Start Year: SoSe 2018
Module Name:	**Fundamentals of Plastic Deformation**		
(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 (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:	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:	IPM.MA.Nr.3709 / Examination number: 51120	Version: 15.01.2020	Start Year: SoSe 2020
Module Name:	**Introduction to Pyrometallurgy**		
(English):			
Responsible:	Charitos, Alexandros / Prof.		
Lecturer(s):	Charitos, Alexandros / Prof.		
Institute(s):	Institute for Nonferrous Metallurgy and Purest Materials		
Duration:	1 Semester(s)		
Competencies:	After successfully completing this module, students should be able to: • Propose a comprehensive preprocessing flowchart for different non-ferrous metals; • Describe fundamental pyrometallurgical processes and be able to compare alternative processes based on desired metal, energy requirements and application aspects; • Advise conceptual designs for pyrometallurgical processes; and • Perform basic thermodynamic predictions for different high-temperature processes.		
Contents:	This course aims to provide master students with an understanding of the principles governing a range of pyrometallurgical processes applied to extract metals from mineral ores. The course offers an introduction to the history of metallurgy followed by different processes involved in mineral processing methods. Different methods of comminution, sizing and concentration are explained in the course. The main focus of the course is about pyrometallurgical processes including agglomeration, roasting, sintering, smelting, converting, reducing and refining. The thermodynamics of processes and a review of Ellingham diagrams is counted in this course, too. With the aim of deep understanding of the lecture, pyrometallurgical extraction and refining of copper is taught at the end of this course.		
Literature:	- Vignes, A., Extractive Metallurgy, 2011. - Habashi, F., Textbook of Pyrometallurgy, 2002. - Pawlek, F., Metallhüttenkunde- Walter de Gruyter, 1983.		
Types of Teaching:	S1 (SS): Lectures (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:	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. The latter includes preparation and follow-up of the course, literature study and exam preparation.		

Data:	MTMP. MA. Nr. 3565 / Examination number: 9900	Version: 06.11.2018	Start Year: SoSe 2018
Module Name:	**Master Thesis (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):			
Institute(s):	Institute of Iron and Steel Technology Foundry Institute Institute of Metal Forming Institute for Nonferrous Metallurgy and Purest Materials		
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:** 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:	MATSCI. MA. Nr. 2919 / Examination number: 51012	Version: 08.05.2017	Start Year: SoSe 2011
Module Name:	**Materials Science**		
(English):			
Responsible:	Leineweber, Andreas / Prof. Dr. rer. nat. habil.		
Lecturer(s):	Martin, Stefan / Dr.-Ing.		
Institute(s):	Institute of Materials Science		
Duration:	1 Semester(s)		
Competencies:	Qualification for cooperation with engineers. The student is able to relate problems from engineering practice to fundamental concepts from Materials Science.		
Contents:	The lectures deal with the basics of materials science (structure, classes of materials), the main properties and the application of materials.		
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.		
Types of Teaching:	S1 (SS): Lectures (1 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:	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:	WERKMEC. BA. Nr. 253 / Examination number: 41906	Version: 16.02.2022	Start Year: WiSe 2018
Module Name:	**Mechanics of Materials**		
(English):			
Responsible:	Eidel, Bernhard / Prof. Dr.-Ing. habil.		
Lecturer(s):	Prakash, Aruna / Dr.-Ing. 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 technological materials; students will get familiar with elastic, plastic, viscous, viscoelastic and viscoplastic behaviors of materials; development of the ability to assess the behavior of materials and to design structures accordingly.		
Contents:	Most important ingredients are: • continuum mechanics foundations of stress, strain and displacements • rheological models for elastic, plastic, viscous, viscoelastic, and viscoplastic deformation behavior • 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: 31.01.2017	Start Year: SoSe 2018
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 (SS): Lectures (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 [60 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [60 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:	MetMat. MA. Nr. 3213 / Examination number: 50114	Version: 27.06.2016	Start Year: WiSe 2016
Module Name:	**Metallic Materials**		
(English):			
Responsible:	Biermann, Horst / Prof. Dr.-Ing. habil		
Lecturer(s):	Weidner, Anja / Dr.-Ing. habil.		
Institute(s):	Institute of Materials Engineering		
Duration:	1 Semester(s)		
Competencies:	Students will get familiar with metallic materials (ferrous materials, non-ferrous metals, light metals, high-temperature metals), their microstructure and mechanical properties as well as heat treatment. Focus is given to plastic deformation and failure. The module will enable the students to differentiate the different groups of metallic construction materials.		
Contents:	Most important topics are: 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:	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 (WS): Metallic Materials / Lectures (2 SWS)		
Pre-requisites:	**Recommendations:** Basic fundamentals of physics, chemistry and solid materials		
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:	MCT. MA. Nr. 3567 / Examination number: 50227	Version: 31.01.2017	Start Year: WiSe 2017
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 (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: KA [60 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [60 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:	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: 05.06.2019	Start Year: WiSe 2019
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 (WS): Lectures (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: KA [60 min]		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [60 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:	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:	PATA. MA. Nr. 3536 / Examination number: 51014	Version: 07.10.2015	Start Year: WiSe 2015
Module Name:	**Practical Aspects of Thermodynamic Analysis**		
(English):			
Responsible:	Leineweber, Andreas / Prof. Dr. rer. nat. habil.		
Lecturer(s):	Fabrichnaya, Olga / Dr.		
Institute(s):	Institute of Materials Science		
Duration:	1 Semester(s)		
Competencies:	The module provides the knowledge about the diverse experimental approaches for phase diagram constructions. Students will be able to apply thermodynamic calculations for interpretation of thermal analysis data and perform thermodynamic simulation of non-equilibrium processes. They will learn how to apply phase diagrams for development of ceramic and composite materials.		
Contents:	1. Basics of thermal analysis, DTA/HF-DSC, unary systems – application for temperature and enthalpy calibration. 2. Analysis of DTA data for binary alloys – relations to thermodynamics (equilibrium – Scheil approach), eutectic and peritectic reactions, ternary systems. 3. DSC application for heat capacity measurements, other methods 4. Methods for phase equilibrium studies. Influence of kinetics. 5. Applications of phase diagrams for advanced ceramics and composites: directionally solidified eutectic, TBC etc. Practicums: calculations of latent heat – equilibrium case and Scheil approach, calculations of T-zero lines and para-equilibrium, Scheil with fast diffusing elements		
Literature:	Methods for phase diagram determination, J.-C. Zhao (Ed) Elsevier Science (2007) J. LLorca, V. M. Orera “Directionally solidified eutectic ceramic oxides”, Progress in Materials Science 51 (2006) 711-809. Phase diagrams in advanced ceramics. A volume of the treatise on Materials Science and technology. Ed. A.M. Alper, Academic press, Elsevier (1995) Thermo-Calc Examples, TC AB Stockholm, Sweden (2006)		
Types of Teaching:	S1 (WS): Lectures (2 SWS)		
Pre-requisites:	**Recommendations:** Grundlagen der Werkstoffwissenschaft II, 2015-03-30 Grundlagen der Werkstoffwissenschaft I, 2015-03-30		
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 10 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 10 und mehr Teilnehmern) [MP mindestens 30 min / KA 90 min]		
Credit Points:	3		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 90h. It is the result of 30h attendance and 60h self-studies.		

Data:	RSMMT MA: Nr. / Examination number: 59907	Version: 21.06.2019	Start Year: SoSe 2020
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 for 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 (1 SWS) S1 (SS): Practical Application (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: AP: Literature Report		
	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: AP: Literaturarbeit		
Credit Points:	3		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): AP: Literature Report [w: 1]		
Workload:	The workload is 90h. It is the result of 45h attendance and 45h 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:	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:	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:	**Recommendations:** Keine		
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:	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:	TLFP. MA. Nr. 3571 / Examination number: 50322	Version: 12.07.2019	Start Year: SoSe 2018
Module Name:	**Technology of Long and 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:	2 Semester(s)		
Competencies:	Part 1 (Long Products): 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. Part 2 (Flat Products): 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.		
Contents:	Part 1 (Long Products): 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. Part 2 (Flat Products): 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. Based on content of Part 1, 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:	Teil 1: Hensel, Poluchin: Technolgie der Metallformung – Eisen- und Nichteisenmetalle; Deutscher Verlag für Grundstoffindustrie, Leipzig 1990; Kawalla: Herstellung von Stabstahl und Draht, Tagungsband MEFORM 2002; R. Kawalla: Herstellung von Rohren und Profilen, Tagungsband MEFORM 2001; R. Kawalla: Innovation Draht, Tagungsband MEFORM 2007; Teil 2: Béranger: The Book of Steel, Lavoisier Publishing Inc. 1996; Kawalla: Herstellung von Bändern und Blechen, MEFORM 2000		
Types of Teaching:	S1 (SS): Lectures (2 SWS) S2 (WS): Lectures (2 SWS) S2 (WS): Seminar (1 SWS)		

Pre-requisites:	**Recommendations:** Fundamentals of Plastic Deformation
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 45 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 45 min / KA 90 min]
Credit Points:	7
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]
Workload:	The workload is 210h. It is the result of 75h attendance and 135h self-studies.

Data:	TMP. MA. Nr. / Examination number: 51015	Version: 26.04.2019	Start Year: WiSe 2019
Module Name:	**Thermodynamics of Materials without Lab Course**		
(English):			
Responsible:	Leineweber, Andreas / Prof. Dr. rer. nat. habil.		
Lecturer(s):	Fabrichnaya, Olga / Dr.		
Institute(s):	Institute of Materials Science		
Duration:	1 Semester(s)		
Competencies:	The students understand thermodynamic properties of materials and are able to apply calculation methods of phase diagrams.		
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		
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)		
Types of Teaching:	S1 (WS): Lectures (2 SWS)		
Pre-requisites:	**Recommendations:** Background in physical chemistry and materials science		
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 120 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 120 min]		
Credit Points:	3		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 90h. It is the result of 30h attendance and 60h 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.		

Freiberg, den 06. April 2022

gez.
Prof. Dr. Klaus-Dieter Barbknecht
Rektor

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