

**Modulhandbuch  
für den  
Masterstudiengang  
Technology and Application of Inorganic Engineering  
Materials**

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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:	CerEng. MA. Nr. / Examination number: 40912	Version: 15.06.2016 	Start Year: WiSe 2016
Module Name:	<b>Ceramic Engineering</b>		
(English):			
Responsible:	<a href="#">Aneziris, Christos G. / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Aneziris, Christos G. / Prof. Dr.-Ing.</a>		
Institute(s):	<a href="#">Institute of Ceramics, Refractories and Composite Materials</a>		
Duration:	1 Semester(s)		
Competencies:	<p>Students will understand, apply, improve and generate ceramic materials:</p> <ul style="list-style-type: none"> <li>• in micro structural design,</li> <li>• ceramic processing,</li> <li>• testing and</li> <li>• application</li> </ul>		
Contents:	<p>Most important ingredients are:</p> <ul style="list-style-type: none"> <li>• definition, bonding,</li> <li>• micro structure, density, porosity</li> <li>• mechanical properties,</li> <li>• thermal and thermo mechanical properties</li> <li>• chemical properties</li> <li>• sintering</li> <li>• basics in ceramic technology, theoretical</li> <li>• ceramic technology pressing/extruding/casting, experimental</li> <li>• engineering ceramics, alumina/zirconia</li> <li>• engineering ceramics, silicon carbide</li> <li>• functional ceramics, non linear dielectric/piezoelectric properties - barium titanate</li> <li>• refractories, carbon bonded materials</li> <li>• silicate ceramics</li> <li>• Exercise: theoretical density / Enthalpy</li> <li>• Visiting of ceramic plant or research institute</li> </ul>		
Literature:	<p>Introduction to Ceramics, David Kingery  Introduction to the Principles of Ceramic Processing, James Reed  Physical Ceramics, Yet-Ming Chiang, Dunbar Birnie III, W. David Kingery</p>		
Types of Teaching:	S1 (WS): Incl. Exercises / Lectures (2 SWS)		
Pre-requisites:	<b>Recommendations:</b> Basic fundamentals of materials science		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	<p>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]</p> <p>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]</p>		
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:	Examination number: 40315	Version: 21.08.2017 	Start Year: WiSe
Module Name:	<b>Conception of Process Equipment</b>		
(English):			
Responsible:	<a href="#">Peuker, Urs Alexander / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Peuker, Urs Alexander / Prof. Dr.-Ing.</a>		
Institute(s):	<a href="#">Institute of Mechanical Process Engineering and Mineral Processing</a>		
Duration:	1 Semester(s)		
Competencies:	The aim is the teaching of engineering thinking to (mineral) process engineers. It brings together the approaches of mechanical engineering and the process laws of process engineering. The students learn to analyze how a unit-operation is set up in an apparatus. The module further introduces material laws of suspensions, wet and dry powders and particle beds. Auxiliary units like pumps, gas filters, mixing vessels and industrial waste water technology are introduced.		
Contents:	<p>Design strategies</p> <ul style="list-style-type: none"> <li>• Design of apparatus / design of process</li> <li>• Analyze of unit operation and process equipment</li> <li>• Conceptual design</li> <li>• Functionality</li> <li>• New principles / parallelizing / serializing</li> </ul> <p>Material laws</p> <ul style="list-style-type: none"> <li>• Suspension Rheology</li> <li>• Solids Mechanics</li> <li>• Agglomerate durability</li> <li>• compression laws</li> </ul> <p>Auxiliary equipment</p> <ul style="list-style-type: none"> <li>• Mixing vessels</li> <li>• Gas cleaning by filters</li> <li>• Settlers</li> <li>• Liquid filters</li> <li>• Membranes</li> </ul>		
Literature:	to be announced		
Types of Teaching:	S1 (WS): Lectures (2 SWS)		
Pre-requisites:			
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	<p>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]</p> <p>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]</p>		
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:	DDCBM. MA. Nr. 3601 / Examination number: 40706	Version: 15.06.2017 	Start Year: WiSe 2019
Module Name: (English):	<b>Design and Development of Chemically Bonded Materials</b>		
Responsible:	<a href="#">Bier, Thomas A. / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Bier, Thomas A. / Prof. Dr.-Ing.</a>		
Institute(s):	<a href="#">Institute of Ceramics, Refractories and Composite Materials</a>		
Duration:	1 Semester(s)		
Competencies:	<p>Students will acquire knowledge on chemical bonding reactions such as hydration and the subsequent microstructures for different raw materials. Methods to design experiments to meet defined specifications.</p> <p>They will be able to apply this knowledge in order to:</p> <ul style="list-style-type: none"> <li>&gt; define a concept through specifications</li> <li>&gt; develop a prototype material</li> <li>&gt; create a data sheet</li> </ul>		
Contents:	<p>Methods of DOE  Material and Function oriented specifications  Functions of binders  Functions of additives  OPC based mix design  Ternary binders OPC-CAC-C5  Grouting mortars, self levelling underlayments, adhesives  Insulating and low density material (porous concrete, AAC)  Ultra high strength concrete (MDF, DSP)  Self Compacting Concrete - SCC  LCC and ULCC Castables</p>		
Literature:			
Types of Teaching:	S1 (WS): Design of CBM / Lectures (2 SWS) S1 (WS): Exercises (1 SWS)		
Pre-requisites:	<b>Recommendations:</b> Basic knowledge in Cement Chemistry		
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.		

Daten:	DEU A1/ 1.Sem. BA. Nr. 948 / Prüfungs-Nr.: 71101	Stand: 04.08.2017 	Start: WiSe 2016
Modulname:	<b>Deutsch A1/ 1. Semester</b>		
(englisch):	German A 1/ 1st Semester		
Verantwortlich(e):	<a href="#">Polanski, Katja</a>		
Dozent(en):			
Institut(e):	<a href="#">Internationales Universitätszentrum/ Sprachen</a>		
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 Allgemesprache sowie landeskundliche Kenntnisse.		
Inhalte:	Kommunikation im Alltag (Menschen kennen lernen, Einkaufen, Restaurantbesuch, Tagesabläufe, Uhrzeit); Grammatik: zum Beispiel Fragestellungen, Zahlen, Konjugation der Verben, Präsens und Präteritum, Mengenangaben, Plural der Nomen, Komposita		
Typische Fachliteratur:	Begegnungen A1+, Schubert Verlag		
Lehrformen:	S1 (WS): Übung (4 SWS)		
Voraussetzungen für die Teilnahme:	<b>Empfohlen:</b> 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:	<b>Deutsch A1/ 2. Semester</b>		
(englisch):	German A1/ 2nd Semester		
Verantwortlich(e):	<a href="#">Polanski, Katja</a>		
Dozent(en):			
Institut(e):	<a href="#">Internationales Universitätszentrum/ Sprachen</a>		
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 Allgemesprache 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:	<b>Obligatorisch:</b> <a href="#">Deutsch A1/ 1. Semester, 2015-08-26</a> 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:	EA MA. Nr. 3581 (for students of TAIM only) / Examination number: 40916	Version: 16.01.2018 	Start Year: WiSe 2019
Module Name: (English):	<b>Experimental Assignment (Ceramic and Steel Technology)</b>		
Responsible:	<a href="#">Aneziris, Christos G. / Prof. Dr.-Ing. Volkova, Olena / Prof. Dr.-Ing.</a>		
Lecturer(s):			
Institute(s):	<a href="#">Institute of Ceramics, Refractories and Composite Materials</a> <a href="#">Institute of Iron and Steel Technology</a>		
Duration:	1 Semester(s)		
Competencies:	Analysis of tasks in the field of ceramics and steel technology Derivation of reasonable solutions Planning, implementation, and evaluation of experiments Presentation and written summarization of the problems (task, approach, analysis, results) from an engineering viewpoin		
Contents:	Specification of tasks by means of literature and patent researches, construction/modification of experimental facilities, conducting experimental investiation, interpretation of results and their presentation in the form of a written work, presentation and discussion of the work in a seminar, learning presentation skills		
Literature:	Project-specific		
Types of Teaching:	S1 (WS): Consultations, experimental activities / practical training / Seminar (12 SWS)		
Pre-requisites:	<b>Recommendations:</b> Knowledge of ceramic engineering and Technology of Iron and Steel		
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: AP: Script MP: Colloquium [60min] Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: AP: Schriftliche Studienarbeit MP: Kolloquium [60min]		
Credit Points:	10		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): AP: Script [w: 2] MP: Colloquium [60min] [w: 1]		
Workload:	The workload is 300h. It is the result of 180h attendance and 120h self-studies.		


Data:	FFMAT. MA. Nr. 3569 / Examination number: 50930	Version: 17.06.2019 	Start Year: WiSe 2018
Module Name: (English):	<b>Fundamentals of Ferrous Materials</b>		
Responsible:	<a href="#">Volkova, Olena / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Wendler, Marco / Dr.-Ing.</a>		
Institute(s):	<a href="#">Institute of Iron and Steel Technology</a>		
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:	<ul style="list-style-type: none"> <li>• B.C. De Cooman, J. Speer, Fundamentals of Steel Product Physical Metallurgy, Assn. of Iron and Steel Engineers, 1<sup>st</sup> Ed., 2011.</li> <li>• H.K.D.H. Bhadeshia and R.W.K. Honeycombe, Steels: Microstructure and Properties, Butterworth-Heinemann, 4<sup>th</sup> Ed., 2017.04.12 W.</li> </ul>		
Types of Teaching:	S1 (WS): Lectures (2 SWS) S1 (WS): Seminar (1 SWS)		
Pre-requisites:	<b>Recommendations:</b> 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: 50329	Version: 24.06.2022	Start Year: SoSe 2023
Module Name:	<b>Fundamentals of Metal Forming</b>		
(English):			
Responsible:	<a href="#">Prahl, Ulrich / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Prahl, Ulrich / Prof. Dr.-Ing.</a>		
Institute(s):	<a href="#">Institute of Metal Forming</a>		
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:	<ul style="list-style-type: none"> <li>• Introduction into the subject field</li> <li>• Mechanisms of plastic deformation</li> <li>• Definition of forming specific characteristics</li> <li>• Flow stress behavior during hot and cold forming (including influences on flow stress)</li> <li>• Softening and hardening behavior</li> <li>• Methods to determine of flow stress</li> <li>• Constitutive equations in forming</li> <li>• Analytic determination of force and work</li> <li>• Introduction of several forming processes</li> </ul>		
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:	ISA. MA. Nr. / Examination number: 50734	Version: 14.06.2020 	Start Year: WiSe 2022
Module Name:	<b>Introduction to Sensors and Actuators</b>		
(English):			
Responsible:	<a href="#">Joseph, Yvonne / Prof. Dr.</a>		
Lecturer(s):	<a href="#">Joseph, Yvonne / Prof. Dr.</a>		
Institute(s):	<a href="#">Institute of Electronic and Sensor Materials</a>		
Duration:	1 Semester(s)		
Competencies:	Apply techniques for qualitative and quantitative exploration and physicochemical characterization of resources present in the environment, including spatial and temporal variability. Apply techniques to assess environmental impacts of products and processes. Insights in the different (technological) options for optimizing resource flows in the different parts of the value chain and be able to compare them, taking technical and economic aspects as well as social and environmental impact into account. Consult specialist literature and interpret it critically according to scientific standards. Understand the complexity of a problem/system using quantitative methods. Consider specifications and technical, economic and social preconditions and transform them into a sustainable and qualitative system, product, service or process. Entrepreneurial mindset to develop new ideas within a multidisciplinary context.		
Contents:	Physical (e.g. temperature, force, acceleration, etc.) chemical (gas sensors, ion sensors) and biological sensors and actuators will be discussed. First, the physical principles are presented and then applications will be given. The focus is on the relationship between the parameters of the finished device and the properties of the used materials to enable their applications. Specific examples of sensors and actuators are discussed in their measurement environment.		
Literature:	Peter Gründler, Chemical Sensors, Springer, 2007, ISBN: 9783540457435;		
Types of Teaching:	S1 (WS): Lectures (2 SWS) S1 (WS): Seminar (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: 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:	LabWorkCer. MA. Nr. / Examination number: 40915	Version: 29.09.2017 	Start Year: WiSe 2017
Module Name:	<b>Laboratory Ceramic Courses</b>		
(English):			
Responsible:	<a href="#">Aneziris, Christos G. / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Schmidt, Gert / Dr.-Ing.</a> <a href="#">Aneziris, Christos G. / Prof. Dr.-Ing.</a> <a href="#">Hubálková, Jana / Dr.-Ing.</a>		
Institute(s):	<a href="#">Institute of Ceramics, Refractories and Composite Materials</a>		
Duration:	1 Semester(s)		
Competencies:	Students will understand and apply ceramic materials: <ul style="list-style-type: none"> <li>• ceramic materials in micro structural design,</li> <li>• ceramic processing,</li> <li>• testing and (iv) application</li> </ul>		
Contents:	6 experimental works with following topics: <ul style="list-style-type: none"> <li>• Raw material assessment,</li> <li>• Slip casting,</li> <li>• Press forming,</li> <li>• Plastic forming,</li> <li>• Sintering and evaluation of the physical properties,</li> <li>• High-temperature properties</li> </ul>		
Literature:	Introduction to the Principles of Ceramic Processing, James Reed Physical Ceramics, Yet-Ming Chiang, Dunbar Birnie III, W. David Kingery		
Types of Teaching:	S1 (WS): Laboratory work / Practical Application (5 SWS)		
Pre-requisites:	<b>Recommendations:</b> <a href="#">Ceramic Engineering, 2016-06-15</a> Basic fundamentals of 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: AP: Preparation and execution of the experiments incl. lab report Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: AP: Vorbereitung und Durchführung der Experimente incl. Laborbericht		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): AP: Preparation and execution of the experiments incl. lab report [w: 1]		
Workload:	The workload is 150h. It is the result of 75h attendance and 75h self-studies. The self-studies encompass: preliminary preparation, post-processing of experimental data, drafting of the 6 reports.		


Data:	MTAIEM. MA. Nr. 3602 / Examination number: -	Version: 16.01.2018 	Start Year: SoSe 2019
Module Name:	<b>Master Thesis (Technology and Application of Inorganic Engineering Materials)</b>		
(English):			
Responsible:	<a href="#">Aneziris, Christos G. / Prof. Dr.-Ing.</a> <a href="#">Volkova, Olena / Prof. Dr.-Ing.</a>		
Lecturer(s):			
Institute(s):	<a href="#">Institute of Ceramics, Refractories and Composite Materials</a> <a href="#">Institute of Iron and Steel Technology</a>		
Duration:	1 Semester(s)		
Competencies:	The objective of the master thesis is to give the students the opportunity to apply the knowledge acquired during the studies on a research project.		
Contents:			
Literature:	Project specific		
Types of Teaching:	S1 (SS): Thesis / Thesis (6 Mon)		
Pre-requisites:	<b>Mandatory:</b> - Abschluss aller Pflichtmodule des 1. und 2. Semesters sowie des Moduls „Experimental Assignment (Ceramic and Steel Technology)“ und - höchstens drei offene Prüfungsleistungen in noch nicht abgeschlossenen Modulen (- all modules of the first and second term as well as the Modul of „Experimental Assignment (Ceramic and Steel Technology) have to be passed and - only three examinations have not been taken)		
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*: Script MP*: Colloquium [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 [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*: Script [w: 2] MP*: Colloquium [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: 02.06.2022 	Start Year: SoSe 2023
Module Name:	<b>Materials Science</b>		
(English):			
Responsible:	<a href="#">Leineweber, Andreas / Prof. Dr. rer. nat. habil.</a>		
Lecturer(s):	<a href="#">Martin, Stefan / Dr.-Ing.</a>		
Institute(s):	<a href="#">Institute of Materials Science</a>		
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 (2 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:	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:	WERKMEC. BA. Nr. 253 / Examination number: 41906	Version: 16.02.2022 	Start Year: WiSe 2018
Module Name:	<b>Mechanics of Materials</b>		
(English):			
Responsible:	<a href="#">Eidel, Bernhard / Prof. Dr.-Ing. habil.</a>		
Lecturer(s):	<a href="#">Prakash, Aruna / Dr.-Ing.</a> <a href="#">Eidel, Bernhard / Prof. Dr.-Ing. habil.</a>		
Institute(s):	<a href="#">Institute of Mechanics and Fluid Dynamics</a>		
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:	<p>Most important ingredients are:</p> <ul style="list-style-type: none"> <li>• continuum mechanics foundations of stress, strain and displacements</li> <li>• rheological models for elastic, plastic, viscous, viscoelastic, and viscoplastic deformation behavior</li> <li>• multi-axial continuum laws for anisotropic elasticity and plasticity</li> <li>• extended strength and failure theories / criteria for multiaxial loading</li> </ul>		
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:	<b>Recommendations:</b> Basic knowledge in engineering mechanics		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	<p>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.</p> <p>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.</p>		
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:	<b>Melting Technology in Foundries</b>		
(English):			
Responsible:	<a href="#">Wolf, Gotthard / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Dommaschk, Claudia / Dr.-Ing.</a> <a href="#">Keßler, Andreas / Dr.-Ing.</a>		
Institute(s):	<a href="#">Foundry Institute</a>		
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:	MetMat. MA. Nr. 3213 / Examination number: 50114	Version: 27.06.2016 	Start Year: WiSe 2016
Module Name:	<b>Metallic Materials</b>		
(English):			
Responsible:	<a href="#">Biermann, Horst / Prof. Dr.-Ing. habil</a>		
Lecturer(s):	<a href="#">Weidner, Anja / Dr.-Ing. habil.</a>		
Institute(s):	<a href="#">Institute of Materials Engineering</a>		
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:	<b>Recommendations:</b> 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:	OPMAN. MA. Nr. 2970 / Examination number: 61304	Version: 06.07.2015 	Start Year: WiSe 2016
Module Name:	<b>Operations Management</b>		
(English):			
Responsible:	<a href="#">Höck, Michael / Prof. Dr.</a>		
Lecturer(s):	<a href="#">Höck, Michael / Prof. Dr.</a>		
Institute(s):	<a href="#">Professor of Industrial Management, Production Management and Logistics</a>		
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:	<b>Recommendations:</b> 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: (English):	<b>Practical Aspects of Thermodynamic Analysis</b>		
Responsible:	<a href="#">Leineweber, Andreas / Prof. Dr. rer. nat. habil.</a>		
Lecturer(s):	<a href="#">Fabrichnaya, Olga / Dr.</a>		
Institute(s):	<a href="#">Institute of Materials Science</a>		
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:	<ol style="list-style-type: none"> <li>1. Basics of thermal analysis, DTA/HF-DSC, unary systems - application for temperature and enthalpy calibration.</li> <li>2. Analysis of DTA data for binary alloys - relations to thermodynamics (equilibrium - Scheil approach), eutectic and peritectic reactions, ternary systems.</li> <li>3. DSC application for heat capacity measurements, other methods</li> <li>4. Methods for phase equilibrium studies. Influence of kinetics.</li> <li>5. Applications of phase diagrams for advanced ceramics and composites: directionally solidified eutectic, TBC etc.</li> </ol> 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:	<b>Recommendations:</b> <a href="#">Grundlagen der Werkstoffwissenschaft II, 2015-03-30</a> <a href="#">Grundlagen der Werkstoffwissenschaft I, 2015-03-30</a>		
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:	PCM MA. Nr. 3582 (for students of TAIM only) / Examination number: 50933	Version: 17.06.2019 	Start Year: SoSe 2018
Module Name:	<b>Practical Course Metallurgy</b>		
(English):			
Responsible:	<a href="#">Volkova, Olena / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Heller, Hans-Peter. / Dr.-Ing.</a> <a href="#">Kreschel, Thilo / Dr.-Ing.</a> <a href="#">Gutte, Heiner / Dr.</a>		
Institute(s):	<a href="#">Institute of Iron and Steel Technology</a>		
Duration:	1 Semester(s)		
Competencies:	Upon successful completion of the module, the students will have ready-to-use practical knowledge of iron and steel processing, testing and application, heating, melting, solidification, thermophysical properties of melted steels and slag. This knowledge enables the students to independently evaluate and solve application-oriented engineering problems.		
Contents:	Thermoelectrically temperature measurements, optical temperature measurements, reduction of iron ores, heating and melting by induction, electro slag remelting, solidification of metals, ladle stirring by inert gas, metallurgical analysis I, metallurgical analysis II, metallurgical analysis III, EMF-measurement in liquid steel, thermophysical properties of slag and metals.		
Literature:	<ul style="list-style-type: none"> <li>• F. Oeters, Metallurgy of steelmaking, Verlag Stahleisen GmbH, Berlin 1994</li> <li>• A. Babich, D. Senk, H.W. Gudenau, Ironmaking, Verlag Stahleisen GmbH, Duesseldorf, 2016</li> <li>• S. Seetharaman, TREATISE ON PROCESS METALLURGY, Volume 3: Industrial Processes, Part A, Elsevier, 2014</li> </ul>		
Types of Teaching:	S1 (SS): Practical Application (5 SWS)		
Pre-requisites:	<b>Recommendations:</b> 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: AP: Preparation and execution of the experiments incl. lab report Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: AP: Vorbereitung und Durchführung der Experimente incl. Laborbericht		
Credit Points:	5		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): AP: Preparation and execution of the experiments incl. lab report [w: 1]		
Workload:	The workload is 150h. It is the result of 75h attendance and 75h self-studies.		

Data:	RefCerMA.Nr. 3580 (for Students of TAIM only) / Examination number: 40913	Version: 14.06.2017 	Start Year: WiSe 2018
Module Name:	<b>Refractory Ceramics</b>		
(English):			
Responsible:	<a href="#">Aneziris, Christos G. / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Aneziris, Christos G. / Prof. Dr.-Ing.</a>		
Institute(s):	<a href="#">Institute of Ceramics, Refractories and Composite Materials</a>		
Duration:	1 Semester(s)		
Competencies:	<p>Students will understand and apply</p> <ul style="list-style-type: none"> <li>• Refractory ceramics in micro and macro structural design,</li> <li>• refractories processing,</li> <li>• testing and (iv) application.</li> </ul>		
Contents:	<p>Most important ingredients are:</p> <ul style="list-style-type: none"> <li>• definition, bonding,</li> <li>• micro structure design, density, porosity</li> <li>• mechanical properties,</li> <li>• thermal and thermo mechanical properties</li> <li>• chemical properties</li> <li>• basics in refractory technology, coarse- and fine-grained refractories</li> <li>• dense shaped products, silica bricks and fused silica ceramics, fireclay and high alumina bricks, basic bricks, zircon- and zirconia containing bricks, carbon and graphite bricks, carbon and graphite containing refractories, silicon carbide bricks, fine-grained oxide and non oxide ceramics, fusion cast bricks, ceramics with low thermal expansion</li> <li>• unshaped refractory materials</li> <li>• heat-insulating ceramic materials application in iron and steel application in non ferrous</li> <li>• application in cement and chemistry application in foundries</li> </ul>		
Literature:	<p>Refractory Ceramics, Routschka, Granitzki, Willey  Introduction to the Principles of Ceramic Processing, James Reed  Physical Ceramics, Yet-Ming Chiang, Dunbar Birnie III, W. David Kingery,  Refractory Castables Engineering, Luz, Braulio, Pandolfelli, Göller</p>		
Types of Teaching:	S1 (WS): Lectures incl. exercise and practise. / Lectures (2 SWS)		
Pre-requisites:	<p><b>Mandatory:</b>  For Students of TAIEM only  <b>Recommendations:</b>  Basic fundamentals of materials science</p>		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	<p>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]</p> <p>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]</p>		
Credit Points:	4		
Grade:	<p>The Grade is generated from the examination result(s) with the following weights (w):  MP/KA [w: 1]</p>		

Workload:	The workload is 120h. It is the result of 30h attendance and 90h self-studies.
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Data:	RSJC MA. Nr. 3599 / Examination number: 40914	Version: 16.01.2018	Start Year: SoSe 2019
Module Name:	<b>Research Seminar and Journal Club (Technology and Application of Inorganic Engineering )</b>		
(English):			
Responsible:	<a href="#">Aneziris, Christos G. / Prof. Dr.-Ing. Volkova, Olena / Prof. Dr.-Ing.</a>		
Lecturer(s):			
Institute(s):	<a href="#">Institute of Ceramics, Refractories and Composite Materials</a> <a href="#">Institute of Iron and Steel Technology</a>		
Duration:	1 Semester(s)		
Competencies:	<p>Upon successful completion of the module, the students will have in-depth knowledge in:</p> <ul style="list-style-type: none"> <li>• Use of databases for literature and patent surveys,</li> <li>• Selection of key literature and their brief presentation,</li> <li>• Evaluation and interpretation of specialized literature and patents,</li> <li>• Systematic presentation of content in the form of short lecture and a written work.</li> </ul> <p>This knowledge enables the students to independently solve engineering problems of relevance.</p>		
Contents:	<p>Most important ingredients are:</p> <ul style="list-style-type: none"> <li>• Literature review on the seminar topic</li> <li>• Attending the seminar</li> <li>• Interacting with the speakers</li> </ul>		
Literature:	seminar specific		
Types of Teaching:	S1 (SS): Seminar (3 SWS)		
Pre-requisites:	<b>Recommendations:</b> Knowledge of Ceramic Engineering and Technology of Iron and Steel		
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	<p>For the award of credit points it is necessary to pass the module exam. The module exam contains: AP: Literature report</p> <p>Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: AP: Literaturbericht</p>		
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:	SSMP MA. / Examination number: 51119	Version: 13.11.2018	Start Year: SoSe 2019
Module Name:	<b>Simulation of Sustainable Metallurgical Process</b>		
(English):			
Responsible:	<a href="#">Stelter, Michael / Prof. Dr.-Ing.</a> <a href="#">Reuter, Markus / Prof. Dr.</a>		
Lecturer(s):	<a href="#">Reuter, Markus / Prof. Dr.</a>		
Institute(s):	<a href="#">Institute for Nonferrous Metallurgy and Purest Materials</a>		
Duration:	1 Semester(s)		
Competencies:	<p>1. Simulation of reactor types</p> <ul style="list-style-type: none"> <li>• modelling and simulation of hydro- and pyrometallurgical reactors for primary and secondary resources and determination of mass and energy balances as well as minerals processing</li> <li>• determination of ecological and economic footprint of reactors</li> </ul> <p>2. Modelling of processing flowsheets</p> <ul style="list-style-type: none"> <li>• develop processing flowsheets for non-ferrous metal containing resources</li> <li>• modelling and simulation of hydro- and pyrometallurgical processing plants for primary and secondary non-ferrous resources as well as minerals processing</li> <li>• determination of mass and energy balances of the complete flowsheet and determine optimal processing routes</li> <li>• determination of ecological and economic footprint of complete flowsheets</li> </ul> <p>3. Methods and tools</p> <ul style="list-style-type: none"> <li>• use of simulation tools such as HSC Sim 9.0, FACTSAGE etc. and environmental software tools such as GaBi to evaluate different processing options</li> <li>• create process designs and communicate results to a client and/or stakeholders e.g. NGOs</li> </ul>		
Contents:	<p>Reactor types in process metallurgy and minerals processing (e.g. TSL, Kaldo, flash smelting, QSL, flotation cells etc.) will be compared using simulation cases, evaluated and optimised for metal and minor metal recovery. The environmental footprint as also the economic performance of each reactor type will be compared with each other to establish best options for reactor flotation types as a function of feed types. The student will understand minerals processing and metallurgical reactor technology better and also be in a better position to create more sustainable industry and society.</p> <p>Process design cases will be performed by the students to optimally process different feed types. By using a wider range of reactor types the student will be able to simulate complete flowsheets, provide mass and energy balances at the same time also determine the environmental footprint as well as economic analysis. This course will also examine the impact of product design on the recycling of various end-of-life products such as mobile phones etc. Thus, not only will natural resources be processed in the simulated systems but also materials from the “urban mine”. Therefore, this course will also use this rigorous simulation basis to critically discuss environmental legislation as well as communicate</p>		

	<p>these results to all stakeholders.</p> <p>The course takes place as a 2 week block course in September.</p>
Literature:	<ul style="list-style-type: none"> <li>• E. Worrell, M.A. Reuter (2014): Handbook of Recycling, Elsevier BV, Amsterdam, 595p. (ISBN 978-0-12-396459-5).</li> <li>• M.A. Reuter, R. Matusiewicz, A. van Schaik (2015): Lead, Zinc and their Minor Elements: Enablers of a Circular Economy World of Metallurgy - ERZMETALL 68 (3), 132-146.</li> <li>• M.A. Reuter, A. van Schaik, J. Gediga (2015): Simulation-based design for resource efficiency of metal production and recycling systems, Cases: Copper production and recycling, eWaste (LED Lamps), Nickel pig iron, International Journal of Life Cycle Assessment, 20(5), 671-693.</li> <li>• M.A. Reuter, I. Kojo (2014): Copper: A Key Enabler of Resource Efficiency, World of Metallurgy - ERZMETALL 67 (1), 46-53 (Summary of plenary lecture Copper 2013).</li> <li>• S. Creedy, A. Glinin, R. Matusiewicz, S. Hughes, M.A. Reuter (2013): Outotec® Ausmelt Technology for Treating Zinc Residues, World of Metallurgy - ERZMETALL, 66(4), 230-235.</li> <li>• M.A.H. Shuva, M.A. Rhamdhani, G. Brooks, S. Masood, M.A. Reuter (2016): Thermodynamics data of valuable elements relevant to e-waste processing through primary and secondary copper production - a review, J. Cleaner Production, 131, 795-809.</li> <li>• M.A. Reuter (2016): Digitalizing the Circular Economy - Circular Economy Engineering defined by the metallurgical Internet of Things-, 2016 TMS EPD Distinguished Lecture, USA, Metallurgical Transactions B, 47(6), 3194-3220 (<a href="http://link.springer.com/article/10.1007/s11663-016-0735-5">http://link.springer.com/article/10.1007/s11663-016-0735-5</a>).</li> <li>• I. Rönnlund, M.A. Reuter, S. Horn, J. Aho, M. Päällysaho, L. Ylimäki, T. Pursula (2016): Sustainability indicator framework implemented in the metallurgical industry: Part 1-A comprehensive view and benchmark &amp; Implementation of sustainability indicator framework in the metallurgical industry: Part 2-A case study from the copper industry, International Journal of Life Cycle Assessment, 21(10), 1473-1500 &amp; 21(12), 1719-1748.</li> </ul>
Types of Teaching:	<p>S1 (SS): Block course / Lectures (1 SWS)</p> <p>S1 (SS): Block course / Seminar (2 SWS)</p> <p>S1 (SS): Block course / Practical Application (2 SWS)</p>
Pre-requisites:	<p><b>Recommendations:</b></p> <p>Basic thermodynamic, thermodynamic and kinetic knowledge in process metallurgy</p>
Frequency:	yearly in the summer semester
Requirements for Credit Points:	<p>For the award of credit points it is necessary to pass the module exam.</p> <p>The module exam contains:</p> <p>AP: Report of simulation</p> <p>The student should solve a case/example and hand in the computer file as a document.</p> <p>Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst:</p> <p>AP: Simulationsbeleg</p> <p>Der Student soll einen Fall/Beispiel lösen und die Computerdatei als Dokument einreichen.</p>
Credit Points:	6


Grade:	The Grade is generated from the examination result(s) with the following weights ( $w$ ): AP: Report of simulation [ $w: 1$ ]
Workload:	The workload is 180h. It is the result of 75h attendance and 105h self-studies.

Data:	SPST. MA. Nr. 3568 / Examination number: 50927	Version: 17.06.2019	Start Year: SoSe 2018
Module Name:	<b>Special Steel Technology</b>		
(English):			
Responsible:	<a href="#">Volkova, Olena / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Volkova, Olena / Prof. Dr.-Ing.</a>		
Institute(s):	<a href="#">Institute of Iron and Steel Technology</a>		
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:	<ul style="list-style-type: none"> <li>• F. Oeters, Metallurgy of steelmaking, Verlag Stahleisen GmbH, Berlin 1994</li> <li>• G. Stolte, Secondary Metallurgy, Verlag Stahleisen GmbH, Düsseldorf 2002</li> <li>• S. Seetharaman, TREATISE ON PROCESS METALLURGY, Volume 3: Industrial Processes, Part A, Elsevier, 2014</li> </ul>		
Types of Teaching:	S1 (SS): Lectures (3 SWS) S1 (SS): Seminar (1 SWS)		
Pre-requisites:	<b>Recommendations:</b> 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:	<b>Steel Application</b>		
(English):			
Responsible:	<a href="#">Volkova, Olena / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Wendler, Marco / Dr.-Ing.</a>		
Institute(s):	<a href="#">Institute of Iron and Steel Technology</a>		
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, 1 <sup>st</sup> 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:	<b>Recommendations:</b> 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:	<b>Supply Chain Management</b>		
(English):			
Responsible:	<a href="#">Höck, Michael / Prof. Dr.</a>		
Lecturer(s):	<a href="#">Höck, Michael / Prof. Dr.</a>		
Institute(s):	<a href="#">Professor of Industrial Management, Production Management and Logistics</a>		
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:	<b>Recommendations:</b> 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:	<b>Technology of Iron and Steel</b>		
(English):			
Responsible:	<a href="#">Volkova, Olena / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Gutte, Heiner / Dr.</a>		
Institute(s):	<a href="#">Institute of Iron and Steel Technology</a>		
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:	<ul style="list-style-type: none"> <li>• F. Oeters, Metallurgy of steelmaking, Verlag Stahleisen GmbH, Berlin 1994</li> <li>• A. Babich, D. Senk, H.W. Gudenau, Ironmaking, Verlag Stahleisen GmbH, Duesseldorf, 2016</li> <li>• S. Seetharaman, TREATISE ON PROCESS METALLURGY, Volume 3: Industrial Processes, Part A, Elsevier, 2014</li> </ul>		
Types of Teaching:	S1 (WS): Lectures (2 SWS) S1 (WS): Seminar (1 SWS)		
Pre-requisites:	<b>Recommendations:</b> 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:	TM MA. Nr. / Examination number: 50934	Version: 08.07.2022 	Start Year: WiSe 2022
Module Name:	<b>Thermochemical Modelling</b>		
(English):			
Responsible:	<a href="#">Volkova, Olena / Prof. Dr.-Ing.</a>		
Lecturer(s):			
Institute(s):	<a href="#">Institute of Iron and Steel Technology</a>		
Duration:	1 Semester(s)		
Competencies:	After successful completion 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:	<b>Recommendations:</b> <a href="#">Special Steel Technology, 2019-06-17</a> <a href="#">Technology of Iron and Steel, 2019-06-17</a>		
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:	THT. MA. Nr. / Examination number: 41215	Version: 29.08.2017 	Start Year: WiSe 2018
Module Name:	<b>Thermodynamics and Heat Transfer</b>		
(English):			
Responsible:	<a href="#">Fieback, Tobias / Prof. Dr. Ing.</a>		
Lecturer(s):	<a href="#">Fieback, Tobias / Prof. Dr. Ing.</a>		
Institute(s):	<a href="#">Institute of Thermal Engineering</a>		
Duration:	1 Semester(s)		
Competencies:	<ul style="list-style-type: none"> <li>- knowledge of basic thermodynamic principles</li> <li>- applying of those principles to beginner level thermodynamic processes</li> <li>- getting a brief understanding of heat and mass transfer processes</li> </ul>		
Contents:	<ul style="list-style-type: none"> <li>- Fundamentals of thermodynamics (equations of state, reversible processes, system boundaries)</li> <li>- First and second law of thermodynamics</li> <li>- Thermodynamic properties of pure fluid substances</li> <li>- Thermodynamic investigation of cycle processes (carnot, clausius-rankine, ...)</li> <li>- Thermodynamics of simple mixtures (humid air)</li> <li>- Basic introductions to heat and mass transfer processes</li> </ul>		
Literature:	<ul style="list-style-type: none"> <li>- The Laws of Thermodynamics: A Very Short Introduction; Peter W. Atkins (just for getting started)</li> <li>- Thermodynamik: Grundlagen und technische Anwendungen; H.D. Baehr / S. Kabelac (German)</li> <li>- VDI-Wärmeatlas (Thermodynamic Properties in German)</li> </ul>		
Types of Teaching:	S1 (WS): Lecture / Lectures (1 SWS) S1 (WS): Exercise / 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 10 students or more) [MP minimum 40 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 40 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:	TMP. MA. Nr. / Examination number: 51015	Version: 26.04.2019 	Start Year: WiSe 2019
Module Name:	<b>Thermodynamics of Materials without Lab Course</b>		
(English):			
Responsible:	<a href="#">Leineweber, Andreas / Prof. Dr. rer. nat. habil.</a>		
Lecturer(s):	<a href="#">Fabrichnaya, Olga / Dr.</a>		
Institute(s):	<a href="#">Institute of Materials Science</a>		
Duration:	1 Semester(s)		
Competencies:	The students understand thermodynamic properties of materials and are able to apply calculation methods of phase diagrams.		
Contents:	<p>Most important topics are:</p> <p>Thermodynamic laws and quantities</p> <p>Thermodynamic properties of materials</p> <p>Calculation of complex equilibria in multiphase and multicomponent systems</p> <p>Optimization of phase diagrams</p>		
Literature:	<p>Mats Hillert, "Phase equilibria, phase diagrams and phase transformations", 2nd Ed., Cambridge (2009)</p> <p>Robert de Hoff, "Thermodynamics in Materials Science", 2nd Ed., Taylor &amp; Francis (2006)</p> <p>Hans Leo Lukas, Suzana Fries, Bo Sundman, "Computational Thermodynamics, the CALPHAD method", Cambridge (2007)</p>		
Types of Teaching:	S1 (WS): Lectures (2 SWS)		
Pre-requisites:	<b>Recommendations:</b> Background in physical chemistry and materials science		
Frequency:	yearly in the winter semester		
Requirements for Credit Points:	<p>For the award of credit points it is necessary to pass the module exam.</p> <p>The module exam contains:</p> <p>MP/KA (KA if 6 students or more) [MP minimum 30 min / KA 120 min]</p> <p>Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst:</p> <p>MP/KA (KA bei 6 und mehr Teilnehmern) [MP mindestens 30 min / KA 120 min]</p>		
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:	TFD. MA. Nr. / Examination number: 41911	Version: 29.03.2017 	Start Year: WiSe 2018
Module Name:	<b>Training in Fluid Dynamics</b>		
(English):			
Responsible:	<a href="#">Schwarze, Rüdiger / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Schwarze, Rüdiger / Prof. Dr.-Ing.</a> <a href="#">Bauer, Katrin / Dr. Ing.</a> <a href="#">Heinrich, Martin / Dr. Ing.</a>		
Institute(s):	<a href="#">Institute of Mechanics and Fluid Dynamics</a>		
Duration:	1 Semester(s)		
Competencies:	Students shall recapitulate important principles and corresponding fundamental equations of fluid dynamics. They shall learn the ability to apply their knowledge to flow problems of technical importance. Typical solutions strategies for such problems are trained.		
Contents:	A review of the main concepts of fluid dynamics, e.g. streamline flow, laminar and turbulent flow as well as boundary layers are reviewed. The applications of these concepts for the description and solution of technical flow problems are discussed and trained.		
Literature:	J. F. Douglas et al.: Fluid Mechanics. Harlow: Pearson Education, 2001 M. C. Potter and D. C. Wiggert: Mechanics of Fluids. London: Prentice-Hall, 1997		
Types of Teaching:	S1 (WS): Lectures (1 SWS) S1 (WS): Exercises (2 SWS)		
Pre-requisites:	<b>Recommendations:</b> Knowledge in physics for engineers and fundamentals of fluid dynamics		
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 [45 min] Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [45 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:	TPT. MA. Nr. / Examination number: 40316	Version: 15.09.2022 	Start Year: WiSe 2022
Module Name:	<b>Training in Particle Technology</b>		
(English):			
Responsible:	<a href="#">Peuker, Urs Alexander / Prof. Dr.-Ing.</a>		
Lecturer(s):	<a href="#">Mitarbeiter des Institutes MVT/AT</a> <a href="#">Peuker, Urs Alexander / Prof. Dr.-Ing.</a>		
Institute(s):	<a href="#">Institute of Mechanical Process Engineering and Mineral Processing</a>		
Duration:	1 Semester(s)		
Competencies:	<p>The module aims at recalling the fundamentals of particle technology. It is set up using special exercises to practice scientific and technological calculations of particle size distributions and fundamental micro-processes. The principles of the mechanical micro-processes are introduced.</p> <p>The exercises also apply the fundamental approaches (micro-processes) to describe and to design process equipment. This will be done using case studies.</p>		
Contents:	<p>Particle characterization  Particle size distribution  Mixing of particle size distributions  Separation of particle size distributions (classification)  Grade recovery curves  Micro processes in particle technology</p> <ul style="list-style-type: none"> <li>• Particles in flow-fields (i.e. sedimentation)</li> <li>• Flow through porous media</li> <li>• Particle-particle interactions (e.g. van-der-Waals-forces, electrostatic interactions, DLVO-theory, capillary forces)</li> <li>• Breakage laws (i.e. breakage energy)</li> </ul> <p>Selected case studies form the fields:</p> <ul style="list-style-type: none"> <li>• Filtration</li> <li>• Sedimentation</li> <li>• Agglomeration</li> <li>• Classification</li> <li>• Comminution</li> <li>• And others</li> </ul>		
Literature:	M. Stieß: Mechanische Verfahrenstechnik 1 - Partikeltechnologie, Springer-Verlag, Berlin, Heidelberg, 2009 H. Schubert: Handbuch der Mechanischen Verfahrenstechnik, Wiley-VCH, Weinheim, 2003 selected scientific papers		
Types of Teaching:	S1 (WS): Recall of fundamentals - (also digital available every semester - provided as screencasts) / Lectures (1 SWS) S1 (WS): Application of fundamentals - case studies - (also digital available every semester - provided as screencasts with feedback rounds in a virtual classroom) / 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: in examination variant 1: MP/KA (KA if 8 students or more) [MP minimum 30 min / KA 120 min] or		

	<p>in examination variant 2:  PVL: Midtermtests (parallel to lectures and excercises)  AP: Home work assignment  The variant 2 applies only for students of the virtual faculty.  PVL have to be satisfied before the examination.</p> <hr/> <p>Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst:  in Prüfungsvariante 1:  MP/KA (KA bei 8 und mehr Teilnehmern) [MP mindestens 30 min / KA 120 min]</p> <p style="text-align: center;">oder</p> <p>in Prüfungsvariante 2:  PVL: Testate (veranstaltungsbegleitend)  AP: Hausarbeit  Die Prüfungsvariante 2 gilt nur für Studierende der virtuellen Fakultät.  PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.</p>
Credit Points:	4
Grade:	<p>The Grade is generated from the examination result(s) with the following weights (w):  in examination variant 1:  MP/KA [w: 1]</p> <p style="text-align: center;">or</p> <p>in examination variant 2:  AP: Home work assignment [w: 1]</p>
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies.

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