Daten:	MSMOM / Prüfungs-Nr.: -	Stand: 16.07.2024	Start: WiSe 2024
Modulname:	**Microstructures and Mechanics of Materials**		
(englisch):			
Verantwortlich(e):	Eidel, Bernhard / Prof. Dr.-Ing. habil.		
Dozent(en):	Eidel, Bernhard / Prof. Dr.-Ing. habil.		
Institut(e):	Institut für Mechanik und Fluiddynamik		
Dauer:	1 Semester		
Qualifikationsziele / Kompetenzen:	For the **microstructure part**, students will learn theoretical aspects of microstructural elements in real crystalline materials and their links to different physical properties. They will become able to solve problems of materials scientific relevance. Furthermore, students will be able to transfer their knowledge to new problems. During the practical part of this module, students will additionally learn to apply computational methods that can be used to visualize, analyze and model chosen aspects of microstructures. For the part on **Mechanics of Materials**, students will develop an understanding of the deformation behavior and failure mechanisms of engineering materials; they get familiar with elastic, plastic, viscous, viscoelastic and viscoplastic behaviors of materials; students learn to apply tensor algebra as the language of continuum mechanics; development of the ability to assess the behavior of materials and to design structures accordingly.		
Inhalte:	For the **microstructure part**, the most important topics are: Atomic interactions, crystallography, point defects, dislocations, grain boundaries, strengthening mechanisms, diffusion characteristics and the characteristic length scale associated with each of these elements. Further topics of relevance are dimensional analysis and scaling laws in nature, materials science and mechanics. For the **Mechanics of Materials** part, the most important ingredients are: • vector and tensor algebra • continuum mechanics foundations of stress, strain and displacements • rheological models for elastic, plastic, viscous, viscoelastic, and viscoplastic deformation behavior • time integration algorithms for the inelastic constitutive laws • multi-axial continuum laws for anisotropic elasticity and plasticity, extended strength and failure theories / criteria for multiaxial loading		
Typische Fachliteratur:	W.D. Callister and D.G. Rethwisch: Materials Science and Engineering, an introduction D. Hull and D.J. Bacon: Introduction to dislocations R. Phillips: Crystals, Defects and Microstructures, Modeling across length scale. A.S. Argon: Strengthening Mechanisms in Crystal Plasticity J. Lemaitre and J.-L. Chaboche: Mechanics of Solid Materials, Cambridge University Press,2000		
Lehrformen:	S1 (WS): Fundamentals of Microstructures / Vorlesung (2 SWS) S1 (WS): Fundamentals of Microstructures / Übung (2 SWS) S1 (WS): Mechanics of Materials / Vorlesung (2 SWS) S1 (WS): Mechanics of Materials / Übung (2 SWS)		
Voraussetzungen für die Teilnahme:	**Empfohlen:** Basic knowledge in engineering mechanics. Basic programming/scripting		

	experience in Python. This is satisfied by simultaneously participating in the module „Software Tools for Computational Materials Scientists“.
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 [240 min] PVL: Home work assignments PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.
Leistungspunkte:	10
Note:	Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): KA [w: 1]
Arbeitsaufwand:	Der Zeitaufwand beträgt 300h und setzt sich zusammen aus 120h Präsenzzeit und 180h Selbststudium.