Modulbezeichnung:	**3D Characterization in Materials Science (IMN_M3/4/5/10/11-MWT_M8/9/10/11-NT_3D)** (3D Characterization in Materials Science)	**5 ECTS**
Modulverantwortliche/r:	Erdmann Spiecker	
Lehrende:	Benjamin Apeleo-Zubiri, Erdmann Spiecker	

Startsemester: SS 2022	Dauer: 1 Semester	Turnus: jährlich (SS)
Präsenzzeit: 60 Std.	Eigenstudium: 90 Std.	Sprache: Deutsch und Englisch

Lehrveranstaltungen:

3D Characterization in Materials Science (SS 2022, Vorlesung, 2 SWS, Anwesenheitspflicht, Benjamin Apeleo-Zubiri et al.)

Practical Course to 3D Characterization in Materials Science (SS 2022, Praktikum, 2 SWS, Anwesenheitspflicht, Benjamin Apeleo-Zubiri et al.)

Inhalt:

The module focuses on the application of 3D characterization methods in materials science. Techniques on different length scales (meters down to angstroms) using different probes (e.g. visible light, X-rays, electrons) are covered. The aim of this module is to give an overview over available techniques, to teach the underlying physical principles and to point out specific advantages, challenges and limits, demonstrated on recent research examples. Focal topics are transmission tomography methods on the nano- and microscale, namely high-resolution X-ray computed tomography (Nano-CT) and electron tomography. Sample preparation, data acquisition, 3D reconstruction, data handling and analysis are taught in both the lecture and the practical course. The theoretical background of 3D reconstruction techniques for transmission tomography is also part of the lecture.

Lernziele und Kompetenzen:

Fachkompetenz

Wissen

- Overview over 3D characterization techniques on different length scales using different probes, demonstrated on recent research examples

Verstehen

- Understand the underlying physical principles and specific advantages, challenges and limits of different 3D techniques in materials science

Analysieren

- Learn theoretical and practical aspects of sample preparation, data acquisition, 3D reconstruction and analysis of transmission tomography on the nanoscale

Literatur:

- G. Hübschen, I. Altpeter, ... H.-G. Herrmann: Materials Characterization Using Nondestructive Evaluation (NDE) Methods. Elsevier.
- J. Frank: Electron Tomography - Methods For Three-Dimensional Visualization of Structures in the Cell. Springer.
- T. M. Buzug: Computed Tomography. Springer.
- Burnett et al. 2014, Correlative Tomography, Scientific Reports 4, 4711.
- Hauser et al. 2017, Correlative Super-Resolution Microscopy: New Dimensions and New Opportunities, Chem. Rev. 117, 7428-7456.
- Lecture notes.

Verwendbarkeit des Moduls / Einpassung in den Musterstudienplan:

Das Modul ist im Kontext der folgenden Studienfächer/Vertiefungsrichtungen verwendbar:

[1] **Nanotechnologie (Master of Science)**

(Po-Vers. 2020w | TechFak | Nanotechnologie (Master of Science) | Gesamtkonto | Kernfächer | Mikro- und Nanostrukturforschung | 3D Characterization in Materials Science)

[2] **Nanotechnologie (Master of Science)**
(Po-Vers. 2020w | TechFak | Nanotechnologie (Master of Science) | Gesamtkonto | 1. und 2. Naturwissenschaftlich-technisches Wahlmodul | 3D Characterization in Materials Science)

Studien-/Prüfungsleistungen:

3D Characterization in Materials Science (Prüfungsnummer: 62841)
(englische Bezeichnung: 3D Characterization in Materials Science)

Prüfungsleistung, mündliche Prüfung, Dauer (in Minuten): 15
Anteil an der Berechnung der Modulnote: 100%
weitere Erläuterungen:
Prüfungssprache nach Wahl der Studierenden
Prüfungssprache: Deutsch oder Englisch

Erstablegung: SS 2022, 1. Wdh.: WS 2022/2023
1. Prüfer: Erdmann Spiecker
