



NEW LECTURE – 2186100 – (WS 24/25)

Beyond Conventional Materials – Metamaterials & Architected Structures

Jun.-Prof. Dr.-Ing. Jens Bauer

Who: Master MACH & MatWerk

When: Wed., 9:45–11:15 AM

Where: Bldg. 10.91 Room 227/3

Artificial Materials from Architected Building Blocks

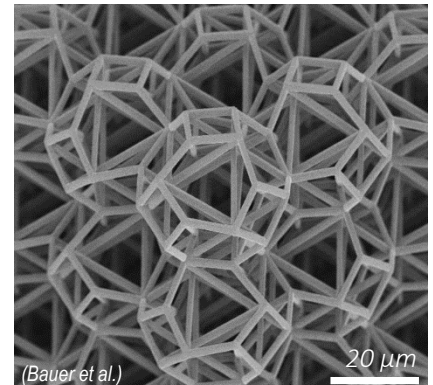
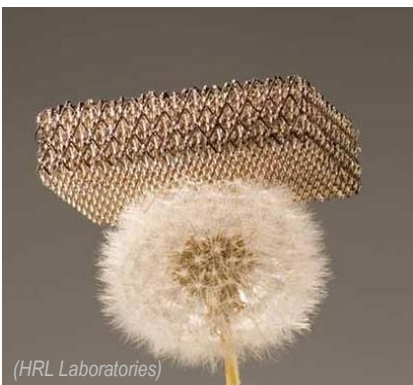
Conventional material design focuses on engineering the chemistry and microstructure of solids. Metamaterials go beyond these classical approaches. They are artificial materials that are constructed from rationally designed spatial building blocks, like lattice-truss architectures. This rational architecture grants unique unconventional - classically impossible - properties. With the recent progress in additive manufacturing, this universal concept is being adopted across many fields, including optics, acoustics, thermal transport and mechanics, with examples ranging from thermal cloaking in microelectronics to ultra-strong lightweight aerospace structures. This course provides a practical introduction covering the fundamentals of different mechanical metamaterial architectures. Design principles, mechanical models and applicable fabrication techniques from the macro- to the nanoscale are discussed in the context of emerging applications across different industries and state-of-the-art scientific directions.

Obtain a Practical Toolkit to Develop Next-Generation Eng. Systems

- Learn to design metamaterial architectures
- Predict and engineer their behavior with mathematical models
- Learn about 3D-printing & assembly fabrication routes, and their design & material implications
- Understand how architecture can leverage extreme physical size-effects at small scale

Metamaterial Design as a Technology Enabler

- Learn about emerging applications across different industries
- Discuss examples from aerospace, aviation, automotive, medicine, microsystem technology, etc.
- Obtain insights into state-of-the-art scientific research



Success evaluation: ~30 min oral exam in English or German

Prerequisites: none, knowledge in engineering mechanics & materials science recommended