Friedrich-Alexander-Universität
Research Center for
Mathematics of Data | MoD

FAU MoD Lecture Series



From Process Physics to Predictive Manufacturing: Challenges in Modelling Electron Beam Powder Bed Fusion

Matthias Markl

FAU, FRIEDRICH-ALEXANDER-UNIVERSITÄT
ERLANGEN-NÜRNBERG

MOD.FAU.EU

#FAUMoDLecture

WHEN

Monday **November 30, 2026**
11:00H (Berlin time)

WHERE

On-site / Online

Friedrich-Alexander-Universität
Erlangen-Nürnberg (FAU).
Room **H13 Johann-Radon-Hörsaal**
Felix-Klein building
Cauerstraße 11, 91058
Erlangen. Bavaria, Germany

Live-streaming:
https://www.fau.tv/clip/id/64145

Electron Beam Powder Bed Fusion (PBF-EB) is a complex additive manufacturing process involving multiple interacting physical phenomena across a wide range of spatial and temporal scales. Understanding the relationships between process parameters, material behaviour and the resulting material properties remains a major challenge, requiring a combination of experimental investigation and physics-based numerical modelling.

This lecture presents the challenges of modelling PBF-EB across different scales, highlighting the capabilities of current simulation approaches as well as their computational demands and limitations. The increasing complexity of the process and the large parameter spaces involved raise fundamental questions about how simulation-based knowledge can be used more efficiently to understand, predict and ultimately design manufacturing processes.

(...) The aim is to illustrate a challenging application domain in which manufacturing science, computational modelling, applied mathematics and artificial intelligence can complement one another.