

# LMS Seminar

## Microstructural Control for Functional Grading

Felicity Freeman

School of Mechanical, Aerospace and Civil Engineering

University of Sheffield

### Date, time, and venue

February 05, 2026 (2 – 3 pm), Amphithéâtre Pole Mecanique

#### Abstract

We constantly demand more from our engineering materials, and a growing recognition of the need to manage scarce material resources sustainably only adds to this pressure. Functionally graded materials, and the intersecting area of metamaterials, support this aim by allowing designers to modify material properties across a component, tailoring performance to need at a local level and achieving a more efficient use of expensive materials. The unique aspect of microstructurally graded materials is to achieve controllable properties while preserving the compositional integrity of the alloy, a key aspect of future recyclability.

In this talk, Dr Freeman will discuss a range of recent work at the University of Sheffield on the manufacture of microstructurally controlled materials for tailored impact absorption, and developments on closed-loop control for microstructural management. This spans across both laser powder-bed fusion and directed energy deposition additive manufacturing platforms.

#### About the speaker

Dr. Freeman is a Lecturer in the Manufacturing & Structural Integrity group, within Mechanical Engineering. She grew up in York and her undergraduate degree was in Natural Sciences at Selwyn College, Cambridge. She started her career as a Manufacturing Engineer at Rolls-Royce in Derby, working on single crystal casting of turbine blades for gas turbine engines, specifically on non-contact measurement and yield improvement using FE modelling. She then moved to Sheffield to do a PhD in additive manufacturing of magnetically-graded stainless steels, for which she was awarded the Bruton Medal from the University of Sheffield, and the EPMA Doctoral Thesis prize.

