RESEARCH THEME

XLII Cycle – a.y. 2026/2027

Title of the doctoral research	Printing with Uncertainty: Rethinking Design in Additive Manufacturing
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Abstract

Additive manufacturing is commonly associated with precision, control, and material efficiency. However, its current implementation relies predominantly on standardized materials and stable production conditions, limiting its relevance for sustainable transitions. Emerging material practices increasingly engage with recycled, bio-based, and locally sourced resources, which introduce variability, inconsistency, and incomplete knowledge into fabrication processes.

This research investigates how design for additive manufacturing can evolve to accommodate such conditions, shifting from a paradigm of control to one of adaptation. It explores how material variability and uncertainty—typically treated as constraints—can become active drivers in the design process.

Through iterative material experimentation and prototyping with non-standardized materials, the project will develop adaptive design strategies and a methodological framework for "printing with uncertainty." Case studies will focus on waste-derived and bio-based materials, examining their implications for form generation, process control, and sustainability.

By reframing additive manufacturing as a situated and responsive practice, this research contributes to bridging material exploration and sustainable design, proposing new approaches that align digital fabrication with circular and locally grounded material systems.

Keywords Additive Manufacturing, Design for Uncertainty, Material Exploration