



LMS Seminar

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Additive manufacturing: design, simulations, and challenges

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ABSTRACT

Additive Manufacturing (AM) – also known as 3D printing – is taking off in many industrial processes. In particular, powder bed fusion for metal manufacturing has definitively changed the way of prototyping metal parts but also plastic 3D printing is changing modern engineering in many aspects. However, AM is a complex physical process, involving different thermo-mechanical phenomena at very different scales; accordingly, simulation is fundamental to predict temperature and stress distributions during and after the printing process. Furthermore, AM allows for new unknown freedom in terms of complex shapes which can be manufactured, opening the door to a new set of design requirements. After a short introduction to the technology and possible applications, the presentation will focus on immersed method to describe the complex physics as well as on solve topology optimization schemes to solve problems associated to the freedom which is possible now thanks to AM. The presentation will close with an excursus on our experience on the use of AM to support industrial developments and the design of innovative AM technologies under developments in our labs.

BIOGRAPHY

After a Bachelor degree in Civil Engineering at the University of Napoli, Italy (1989), a Master of Science (1991) and a Ph.D. (1995) at the University of California at Berkeley, USA, since 2001 Ferdinando Auricchio is Professor of Solids and Structural Mechanics at the University of Pavia, Italy, where he started to develop strong collaborations with the Department of Mathematics (being also a Research Associate at IMATI-CNR Pavia) and with several medical institutions. He received the Euler Medal by ECCOMAS (European Community of Computational Methods in Applied Sciences) in 2016 and he became Fellow Award by IACM (International Association for Computational Mechanics) since 2012. From 2013 to 2019 he served as Vice-President of ECCOMAS. In 2018 he was appointed as a Member of the Italian National Academy of Science, known also as Accademia dei XL. Major research interests are the development of numerical schemes (in particular, finite element methods, both for solids and fluids, with a particular attention to innovative materials), the development of simulation tools to support medical decision (in particular, for cardiovascular applications), and more recently everything that is related to additive manufacturing. In fact, he has organized a 3D-printing lab, exploring new materials, new printing technologies, new uses of 3D printing, ranging from civil engineering 3D printed concrete beams to bio-manufacturing.