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## **Kirigami and auxetics metamaterials for deployment, morphing and multifunctionality**

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### **Abstract**

Kirigami is the ancient Japanese art of cutting and folding paper, while auxetics is referred to a class of structures and materials exhibiting a negative Poisson's ratio effect. In this workshop we will give examples on how auxetic configurations can be used for shape morphing and Deployment and how Kirigami (and paper cutting) design principles can be used to produce auxetics and other producers with abnormal deformation mechanisms with any material substrate for composites manufacturing. We will describe in particular morphing wingbox, deployable reflectors in shape memory alloy, Classes Of Kirigami-inspired Cores and morphing structures for wide ranges of applications - from high-performance sandwich panels to arms for soft robotics. We will also describe concepts of mechanical metamaterials with auxetic characteristics for energy absorption, biomedical and vibration damping applications.

### **Biographical notes**

Fabrizio Scarpa is a leading authority in the field of auxetic materials and sandwich / core structures, also working on graphene, nanocomposites, multifunctional solids and natural fibers for vibroacoustics, morphing, sensing and Structural integrity applications. He has published more than 310 papers in journals and Conference proceedings, reaching an h-index of 44 and receiving more than 4000 citations during the last 5 years. He is PI for UK EPSRC, BIS, Royal Society, FP6, Scarpa has been involved in pilot projects with ESA on the development of deployable Scarpa has been a principal investigator for growing funded by US Army Research Office, Royal Society / National Science Foundation of China and India DST. His work is supported by companies like Rolls-Royce plc, GKN, Dyson Plc, EADS Astrium, Airbus, MTU, Paul Scarpa is also author of 3 patents in the field of cellular structures for vibration damping and auxetic foams (5 published with Rolls). Scarpa has also been seconded to GKN Aerospace for consultancy in the field of composites and smart structures. -Royce plc). Fabrizio Scarpa is a Fellow of the Royal Aeronautical Society, Visiting Scholar at the Georgia Institute of Technology (School of Aerospace Engineering and Visiting Professor at Zhejiang University (School of Materials Science). Professor Scarpa has also been seconded to GKN Aerospace for consultancy in the field of composites and smart structures. PI Scarpa is also author of 3 patents in the field of cellular structures for vibration damping and auxetic foams (5 published with Rolls-Royce plc). Fabrizio Scarpa is a Fellow of the Royal Aeronautical Society, Visiting Scholar at the Georgia Institute of Technology (School of Aerospace Engineering) and Visiting Professor at Zhejiang University (School of Materials Science). Professor Scarpa has also been seconded to GKN Aerospace for consultancy in PI Scarpa is also author of 3 patents in the field of cellular structures for vibration damping and auxetic foams (5 published with Rolls-Royce plc). Fabrizio Scarpa is a Fellow of the Royal Aeronautical Society, Visiting Scholar at the Georgia Institute of Technology (School of Aerospace Engineering) and Visiting Professor at Zhejiang University (School of Materials Science). Visiting Scholar at the Georgia Institute of Technology (School of Aerospace Engineering) and Visiting Professor at Zhejiang University (School of Materials Science). Visiting Scholar at the Georgia Institute of Technology (School of Aerospace Engineering) and Visiting Professor at Zhejiang University Materials Science

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