

DEVELOPMENT OF 3D-STRUCTURES WITH AUXETIC MATERIAL BEHAVIOUR – PRODUCTION OF INNOVATIVE, FOAM-FREE AND CURVED TEXTILES FOR ENERGY ABSORPTION

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Abstract: The project aims to develop 3D-structures with auxetic material behaviour for producing novel, curved energy-absorbing textiles without foam. Auxetic structures have unique material and structural behaviour in compression and tension, resulting in several positive properties, such as good drapability and excellent energy absorption, making them suitable for use as flat impact protection. Based on the current state of the art, auxetic textile structures have only been utilized in two-dimensional space, limiting their functionality to good drapability. To extend the functionality of the entire

structure to the third level for energy absorption, distance-forming monofilament yarns will be used to create auxetic force progressions within the two cover surfaces. If this integration is successful, it could lead to new potential uses and applications for energy-absorbing properties. These properties are characterized by increased drapability, comfort, and improved material and resource utilisation, while maintaining the same level of protection.

Keywords: *auxetic textiles, warp knitting, weft knitting, 3D-printed textiles, 3D-auxetic textiles.*