

# RESEARCH THEME

XXXIX cycle – a.y. 2023/2024

**Title of the doctoral research** Development & modeling of sustainable 3D auxetic fabrics having smart properties

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## Abstract

Common opinion holds that the fashion business is second only to the oil sector when it comes to environmental damage. European Union officials have launched the European Clothing Action Plan to increase the longevity of textiles from their production to their eventual disposal. Landfilling of unwanted textiles has emerged as a major issue around the world. The textile and fashion industries can become far more sustainable if every firm in the supply chain for clothes adopts environmentally friendly procedures.

Rapid progress in the field of auxetic materials has been made in recent years. Numerous auxetic materials, such as fibers, yarn, textiles, foams, composites, metals, ceramics, etc., have been found, created, or studied. It's been suggested that auxetic materials could be used in a wide variety of ways, but so yet, their actual uses have been rather few and few between [2]–[4]. The focus of this research will be on creating novel textile based sustainable auxetic structures with practical use. Auxetic materials are expected to become increasingly prevalent in a variety of fields, including textiles, aerospace, and biomedicine.

Only a few auxetic fabrics have been created, and they aren't exactly ready for usage in clothing just yet. A significant difficulty for textile experts is the creation of auxetic fabrics using non-auxetic yarns. In order to make the most of this innovative textile-based material, further systematic research into auxetic materials is needed. One of the most crucial areas for development is ensuring that auxetic materials retain their auxetic effect after being washed and reused.

This study will develop a new textile based auxetic structures from textile waste, and a model of textile based auxetic structures will be created, making it easier to advance in this field in the future.

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**Keywords** Knitwear, Sustainability, Smart structures, Auxetic knitted fabrics,