

# Preface

The objective of this book is to introduce to the reader the advancement of auxetic materials and their potential applications on the basis of their unique mechanical behavior. Most materials possess positive Poisson's ratio, i.e., these materials get thinner when stretched and fatter when compressed. Auxetic materials possess negative Poisson's ratio, i.e., they get fatter when stretched and thinner when compressed. The motivation that led to the writing of this book is the lack of exposure among scientists and engineers on such materials. This book begins with a historical development on the thoughts and early progress in the area of negative Poisson's ratio materials, followed by Chap. 2 on the various micromechanical models that have been explored to explain and predict the behavior of auxetic materials.

The elasticity of auxetic solids is covered in Chap. 3, while Chap. 4 deals with the stress concentration, fracture, damage, and fatigue of auxetic solids. This is followed by Chap. 5 on the contact mechanics and indentation resilience of auxetic solids. Chapters 6–8 cover auxetic beams, cylinders, disks, spheres, plates, and shells, while Chap. 9 considers thermal stresses in auxetic solids. Chapters 10–14 look at the elastic stability, vibration, and the propagation, transmission, and reflection of elastic waves in auxetic solids. The topic of shear deformation in auxetic structures is dealt with in Chap. 15, while Chaps. 16 and 17 explore simple semi-auxetic solids and auxetic composites.

This book is suitable as a textbook for an introductory graduate course in auxetic materials and structures, and can be used as a reference by researchers and practicing engineers in academia and industry.

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