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Nota di contenuto	Background and Research Scope -- Literature Review and Research Objectives -- Optimisation Framework Formulation.- Optimisation of Bi-Material Layered 1D Phononic Crystal Plates (PhPs).-Optimisation of Porous 2D PhPs with Respect to In Stiffness.- Optimisation of Porous 2D PhPs: Topology Refinement Study and other Aspect Ratios. - Optimisation of Porous 2D PhPs for Deformation- Induced Tunability -- Experimental Validation of Optimised Porous 2D PhPs.- Conclusions and Recommendations for Future Work.
Sommario/riassunto	This thesis proposes novel designs of phononic crystal plates (PhPs) allowing ultra-wide controllability frequency ranges of guided waves at low frequencies, with promising structural and tunability characteristics. It reports on topology optimization of bi-material-layered (1D) PhPs allowing maximized relative bandgap width (RBW) at target filling fractions and demonstrates multiscale functionality of gradient PhPs. It also introduces a multi-objective topology

optimization method for 2D porous PhPs allowing both maximized RBW and in-plane stiffness and addresses the critical role of considering stiffness in designing porous PhPs. The multi-objective topology optimization method is then expanded for designing 2D porous PhPs with deformation induced tunability. A variety of innovative designs are introduced which their maximized broadband RBW is enhanced by, is degraded by or is insensitive to external finite deformation. Not only does this book address the challenges of new topology optimization methods for computational design of phononic crystals; yet, it demonstrated the suitability and applicability of the topological designs by experimental validation. Furthermore, it offers a comprehensive review of the existing optimization-based approaches for the design of finite non-periodic acoustic metamaterial structures, acoustic metamaterial lattice structures and acoustic metamaterials under perfect periodicity. .
