

Analysis of Functionally Graded Porous Beam Resting on Elastic Foundation by using Hyperbolic Shear Deformation Theory

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Abstract: *This research delves into the advanced structural analysis of functionally graded porous beams (FGPBs) resting on elastic foundations, employing the hyperbolic shear deformation theory (HSDT). The FGPBs are characterized by a porosity gradient across their thickness, representing modern engineering materials with tailored properties. The material composition varies continuously, enhancing mechanical performance, while the porosity distribution follows predefined mathematical models, reflecting realistic manufacturing imperfections. The elastic foundation is modeled using combined Winkler and Pasternak parameters to simulate flexible support conditions. The hyperbolic shear deformation theory is adopted to accurately capture shear deformation effects without requiring shear correction factors, ensuring improved precision compared to classical approaches. Governing equations of motion are derived using Hamilton's principle, incorporating the influence of material gradation, porosity distribution, and foundation stiffness. Analytical and numerical techniques are employed to solve these equations, revealing insights into the static and dynamic behavior of FGPBs.*

Keywords: Focus on Functionally Graded Porous Beams (FGPBs), Use of Hyperbolic Shear Deformation Theory (HSDT), Elastic Foundation Modeling, Mathematical Approach, Analytical and Numerical Analysis

