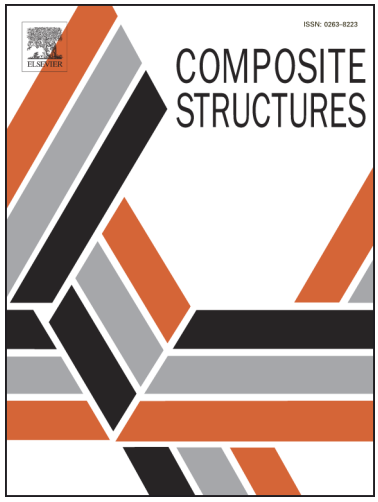

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Mechanical buckling of curvilinear fibre composite laminate with material discontinuities and environmental effects

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Abstract

In this paper, we study the buckling characteristics of curvilinear fibre composite laminates exposed to hygrothermal environment. The formulation is based on the transverse shear deformation theory and it accounts for the lamina material properties at elevated moisture concentrations and thermal gradients. A 4-noded enriched shear flexible quadrilateral plate element is employed for the spatial discretization. The effect of a centrally located cut-out, modeled within the framework of the extended finite element method, is also studied. A detailed parametric investigation by varying the curvilinear fibre angles at the centre and at the edge of the laminate, the plate geometry, the geometry of the cut-out, the moisture concentration, the thermal gradient and the boundary conditions on the buckling characteristics is numerically studied.

Keywords: Mechanical buckling, first order shear deformation theory, extended finite element method, variable stiffness laminated composites, hygrothermal effects.

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