



**A NEW THERMAL THEORY FOR THERMO-MECHANICAL ANALYSIS OF COMPOSITES:  
A novel advanced finite element model for analysis  
of heat transfer in laminated composite structures**

*Antonio Pantano*

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The use of laminated and sandwich construction to achieve multi-functional objectives within a single structure continues to increase. It is especially desirable to use laminated construction in structures exposed to thermal loading, where heat resistant coating materials may be bonded to traditional structural materials. Design of such structures requires an accurate analysis of stresses induced by thermal as well as mechanical loads. A novel laminated plate theory and 3D finite element model based on first-order zig-zag sublaminar approximations are presented for thermal stress analysis of composite laminates and sandwich plates. The finite element is developed with the topology of an eight-noded brick, which can contain several physical layers. The novel features of the formulation allow accurate and efficient prediction of the distribution of temperatures, displacements and stresses in laminated plates wherein the plies have dissimilar thermal and/or structural properties. This work is aimed at research workers and students in mechanical engineering. It would also be of great interest to all scientists concerned with thermal stress behavior of composites.

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