

Functionally graded materials – static and dynamic analyses

Functionally graded materials (FGMs) make up a new class of composite materials that has been known for over a decade now. FGMs are composed of ceramics and metal, where components are so distributed that external ceramic layers, exposed to high temperatures, protect internal metallic functions. The most important problem here is reduction of thermal stresses due to the action of very high temperatures and substantial differences of component thermal expansion coefficients.

Considering growing interest in FGM structures, it is worth to investigate their response to various types of loading; static, dynamic and thermal using various models as they behaviour can vary from the behaviour of structures built in homogenous materials.

In the investigation first the mathematical background and will be formulated. Then the previously plate finite elements will be applied for the static and dynamic analysis of structures made of functionally graded materials resting on non-homogeneous elastic foundations, modelled as the three-parameter foundation.

The investigation will cover: statics, dynamics: eigenproblem, harmonic vibrations, transient analysis (excitation with unit impulse or discontinuously varying force), stability (buckling and postbuckling) analyses. The scope of investigation will comprise analysis of nonlinear response of unstiffened and stiffened FGM plates resting on elastic foundation using various plate theories.