

Design of plated/shell structures under flutter constraints-unidirectional laminates, nanostructures and porous functionally graded materials

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In the present paper a special attention is focused on the influence of the material properties on free vibrations and flutter characteristics. Three materials are discussed in details, i.e. unidirectional laminates, nanocomposites in the foam of nanoplates and carbon nanotubes and porous functionally graded materials (FGM).

Aeroelastic optimization has become an indispensable component in the evaluation of divergence and flutter characteristics for plated/shell structures. The present paper intends to review the fundamental trends and dominant approaches in the optimal design of engineering constructions. This paper describes the formulation of objective functions/functional and the definition of physical (material) variables, particularly in view of composite materials understood in the broader sense as not only multilayered laminates but also as sandwich structures, nanocomposites, functionally graded materials, and materials with piezoelectric actuators/sensors. Moreover, various original aspects of optimization problems of composite structures are demonstrated, discussed, and reviewed in depth. In the modeling of mechanical properties it is assumed that the structure can be inhomogeneous with the prescribed in advanced distributions of porosity/density/stiffness in the x, y or z directions. For FGM, the distributions of the pores can be uniform, symmetric or unsymmetric at the z direction or they can possess the prescribed variability along the x direction or at both x and z directions.

Biography

Justyna Flis graduated Materials Engineering (specialization Construction Materials) at the Cracow University of Technology in 2017. She has been working at the University as a research and teaching assistant since 2019. In January 2021 she obtained her PhD. In her research work, she mainly deals with the optimization of composite structures - laminates, functionally graded materials, nanocomposites. She is a co-author of 8 articles indexed in Scopus, Web of Science. She is a participant in international conferences, e.g. ICCS23, MECHCOMP6, APSAC2020, VIBSYS2020.