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DYNAMICS OF FUNCTIONALLY GRADED CURVED BEAMS CONTAINING PERIODIC LOCAL RESONATORS CONSIDERING PARAMETRIC UNCERTAINTY

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Abstract. The propagation of elastic waves in structures with material and/or geometrical periodic configuration has received significant attention in recent years. The resulting structures are commonly known as metamaterials or metastructures which have interesting vibratory behavior, such as the presence of bandgaps, i.e. regions of frequency where a strong reduction in the propagation of elastic waves can be observed. This particular is useful in absorption of vibrations in general, or suppression of signals within a given frequency range, among others. The band gaps can be modified by the variability associated to uncertainty in parameters or/and periodic structure. This task would be taken into account in this article by means of the parametric probabilistic approach. In this contribution we develop a 1D model for a periodic curved beam made of functionally graded materials. The model contemplates in-plane and out-of-plane motions and it allows for shear deformations and non-uniform warping. This model is adopted as the mean approach to the probabilistic studies related to the propagation of uncertainty associated with variability in properties and periodicity of the structure, as well as the features of the internal resonators. The vibratory response is calculated by means of a finite element formulation. The probabilistic model is constructed appealing to computational model of the deterministic approach, by adopting random variables for the uncertain parameters selected. The probability density functions of the random variables are derived with the Maximum Entropy Principle. The Monte Carlo method is used to perform simulations with independent realizations. It is shown that the proper selection of the dynamic parameters of the internal resonators helps in reducing the vibration patterns of the structure. Moreover, the uncertainties in the parameters of internal resonators and their consequences in the structural dynamic behavior are also evaluated.