Università Politecnica delle Marche

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SEMINAR ANNOUNCEMENT

Nonlinear dynamics of extensible beams: from single mode behavior to dynamic couplings

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Abstract
The goal of this work is to study nonlinear dynamics of a planar hinged-simply supported beam model, taking into account all geometrical nonlinearities and axially oriented linear spring. The model includes: axial, transversal, rotatory inertias; longitudinal, shear and bending deformations, wherein the shearing Timoshenko effect and curvature definition of extensible beam element are engaged. The advanced model allows the analysis of the nonlinear coupling of longitudinal-transverse motion.
To investigate the problem three independent methods are involved: (i) the analytical multiple time scales method with truncation up to the second order of approximation, (ii) the numerical finite element method with the linear modal analysis extended by transient in time domain simulations, (iii) experimental tests on prototype mounted on the slip table preforming kinematic excitation. The experimental outcomes are consistent with the theoretical predictions.
The results of the research show important aspects such as hardening/softening dichotomy for the first (well separated) 7 flexural modes, amplitude-dependent damping, 2: 1 transversal-longitudinal internal resonances, and 3: 1 flexural-flexural internal resonances. In the studied cases, most of the results are wrong or impossible to capture if the longitudinal movement is not included.

All interested people, particularly PhD students, are invited to attend the seminar.
The number of participants is limited because of Covid restrictions, on the base of first arrival criterion.

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