



Nonlinear Dynamics of Continuous Elastic Systems

Jan Awrejcewicz, Vadim Anatolevich Krysko, Alexander F. Vakakis

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There are many monographs in the existing literature devoted to the static and dynamic behavior of plates and shells. Plates and shells are encountered often in engineering applications being integral parts of a wide range of constructions, such as machines, vehicles, airplanes, rockets, ships, bridges, buildings, and containers, to name a few. In addition to the usual requirements posed by engineers related to lightweightness, stiffness, and robust stability properties, there is an additional class of a priori dynamical properties required by modern engineering applications where non-homogeneity and non-uniformity of structural components is often the norm in certain applications. In addition, strict operational requirements in modern engineering applications towards higher speeds, lighter construction, robust and reliable performance, dictate smaller margins of error or deviations from prescribed performances in adverse or uncertain forcing environments. This, in turn, requires the development of new analytical and computational tools capable of addressing challenging and not very well developed topics, such as, nonlinearities affecting the system performance, the effects of unmodeled dynamics on the stability of operation, and the role of uncertainties in the system parameters on the structural response. As a result, there is an ongoing effort to address such issues, leading to the development of new analytical and computational tools, some of which are discussed in this monograph. The monograph follows an approach based on an integrated treatment of analysis and computation. Such a hybrid approach, coupled with computer algebra, can lead to results that cannot be obtained by other standard theories in the field. We show, that in a wide class of problems only a carefully prepared numerical experiment followed by purely mathematical considerations can naturally lead to the sought results. Then numerous analytical constraints are illustrated by examples of application and computational results.

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