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nonlinear analysis of naturally curved and twisted beams undergoing arbitrarily large deflections and rotations. Transverse shearing deformations, torsional warping effects, and elastic couplings resulting from the use of composite materials are all included in the formulation. Numerical results based on a finite element approximation of the

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Euler-Bernoulli beam theory can also be extended to the analysis of curved beams, beam buckling, composite beams, and geometrically nonlinear beam deflection. Euler-Bernoulli beam theory does not account for the effects of transverse shear strain. As a result, it underpredicts deflections and overpredicts natural frequencies.

## **Euler-Bernoulli beam theory - Wikipedia**

Abstract. Structural and aerodynamic non-linearities can lead to persistent oscillations in aeroelastic systems, which allows the conversion of mechanical energy into electric power. Flexible beams represent an example of structures that can be used as energy harvesters. This work aims to model and analyze the non-linearities induced by the flow-structure interaction of an energy harvester consisting of a laminated beam integrated with a piezoelectric sensor.

## **Nonlinear modeling of electro-aeroelastic dynamics of ...**

The proposed isogeometric TSDT approach can be employed to model the nonlinear dynamic equations of motion of any laminated composite beam structure. In this paper, laminated beams are selected as they have a great potential for a range of applications, for example in stability analysis of aircraft wings.

## **Geometrically nonlinear vibration of anisotropic composite ...**

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The history of beam theory (much like many other engineering theories) is a string of reactionary developments based on recent advancements in technology. The most recent surge has been in response to the use of composite materials.

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beam is subjected to a transverse periodic excitation and is resting on a non-linear viscoelastic foundation. Based on the Euler-Bernoulli beam theory and Hamilton's principle, the governing equation of the nanobeam is developed. The variational iteration method is applied to solve the nonlinear governing equation

## **An analytical study on the nonlinear forced vibration of ...**

VAM was first initiated by Berdichevsky in 1979 for shell analysis. He has been applied VAM to

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develop nonlinear shell theory in 1980 and for the beams in 1982. This method can completely justify as a right tool in constructing accurate models for dimensionally reducible structures and in analyzing geometric and material nonlinear models.

### **Variational asymptotic method - Wikipedia**

modelled using thin-walled composite beam theory were studied by Liu and Ren [15]. They showed that the ply angle and blade pre-twist angle combined with the rotational speed influence the vibration and stability of the composite blade. Bekhoucha et al. [16] considered the forced vibration of nonlinear

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