# Augmented Beam Elements Using Unit Deflection Shapes Together with a Finite Element Discretisation of the Cross Section



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# AUGMENTED BEAM ELEMENTS USING UNIT DEFLECTION SHAPES TOGETHER WITH A FINITE ELEMENT DISCRETISATION OF THE CROSS SECTION



Shaker Verlag Okt 2013, 2013. Buch. Condition: Neu. Neuware - This thesis covers the field of augmented beam Finite Elements for geometrical and material linear, prismatic structures in the fields of static and dynamic excitations. An approach of superposed unit deflection shapes which are defined on a two dimensional Finite Element mesh of the cross section is used. The concept of unit deflection shapes is in analogy with the concept of warping torsion of beam elements. The Finite Element mesh of the cross section is also used for the preparation of the unit deflection shapes by solving different differential equations such that unit deflection shapes emerge which most effectively cover the physical effects occurring on beam shaped structures with a three dimensional material law. Eigenmodes of plane systems (shear and bending) are computed as well as solutions of the PDE of shearwarping and distortions of the cross section due to different prescribed strain loads. For dynamic steady state calculations furthermore wavenumber eigenmodes of the infinite continuum under a prescribed frequency are computed and introduced as unit deflection shapes. The unit deflection shapes are orthogonalised such that the effective beam fashioned way of modeling with common support conditions, loads and section forces is preserved. It can be refined arbitrarily by boundary conditions of the continuum (e.g. a fixing or point load on a single node). The method is validated and visualised with several numerical examples which are compared to the results of three dimensional standard Finite Element models. Especially the wavenumber eigenmodes of the infinite continuum but also the other unit deflection shapes enable for a very efficient modeling and calculation of arbitrary prismatic structures. 190 pp. Englisch.

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