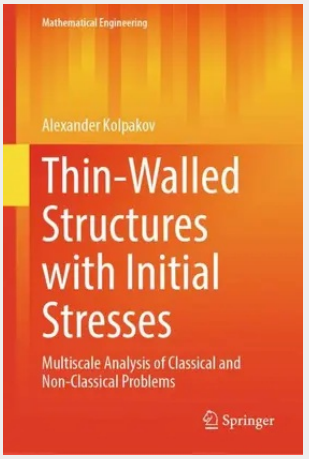
Kolpakov

Thin-Walled Structures with Initial Stresses

Multiscale Analysis of Classical and Non-Classical Problems



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This book is based on two principles:

- the problem for an elastic body with initial stresses is similar to the elasticity theory problem, but the coefficients of the equations relating additional stresses and additional strains do not have all the symmetries incident to the elastic constants.

- since the problems of thin-walled structures are asymptotic in nature, asymptotic methods (including homogenization theory if the structure is non-uniform) should be used to analyze the problems.

Following these principles, one can derive the theory of inhomogeneous/composite structural elements directly from the elasticity theory without to use any additional/simplified hypothesis.

This book treats both homogeneous and non-uniform plates and beams. The chapters on uniform plates and beams may be considered as an alternative method deriving the classical stability equations.

The main part of the book is devoted to non-uniform plates and beams. When performing the analysis of the problems, three possible ranges of initial stresses are distinguished, which correspond to:

- in-plane forces in a plate and axial force in a beam (this is the case of Euler and Bryan forces);

- moments (it happens that the moments of initial stresses influence beams and do not influence plates);

- stresses of the order of elastic constants (which arise, for example, as a result of thermal heating), which affect elastic constants of plates and beams.

Local stresses are recorded for all the considered cases. It makes possible to apply the results presented in the book both to the problem of stability and the strength analysis of the structural elements with initial tresses.

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