

Beam Structures: Classical and Advanced Theories

By Erasmo Carrera, Gaetano Giunta, Marco Petrolo



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Beam theories are exploited worldwide to analyze civil, mechanical, automotive, and aerospace structures. Many beam approaches have been proposed during the last centuries by eminent scientists such as Euler, Bernoulli, Navier, Timoshenko, Vlasov, etc. Most of these models are problem dependent: they provide reliable results for a given problem, for instance a given section and cannot be applied to a different one.

Beam Structures: Classical and Advanced Theories proposes a new original unified approach to beam theory that includes practically all classical and advanced models for beams and which has become established and recognised globally as the most important contribution to the field in the last quarter of a century.

The Carrera Unified Formulation (CUF) has hierarchical properties, that is, the error can be reduced by increasing the number of the unknown variables. This formulation is extremely suitable for computer implementations and can deal with most typical engineering challenges. It overcomes the problem of classical formulae that require different formulas for tension, bending, shear and torsion; it can be applied to any beam geometries and loading conditions, reaching a high level of accuracy with low computational cost, and can tackle problems that in most cases are solved by employing plate/shell and 3D formulations.

Key features:

- compares classical and modern approaches to beam theory, including classical well-known results related to Euler-Bernoulli and Timoshenko beam theories
- pays particular attention to typical applications related to bridge structures, aircraft wings, helicopters and propeller blades
- provides a number of numerical examples including typical Aerospace and Civil Engineering problems
- proposes many benchmark assessments to help the reader implement the CUF if they wish to do so
- accompanied by a companion website hosting dedicated software MUL2 that is used to obtain the numerical solutions in the book, allowing the reader to reproduce the examples given in the book as well as to solve other problems of their own www.mul2.com

Researchers of continuum mechanics of solids and structures and structural

analysts in industry will find this book extremely insightful. It will also be of great interest to graduate and postgraduate students of mechanical, civil and aerospace engineering.

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Editorial Review

From the Back Cover

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Users Review

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