Structural Analysis with the Finite Element Method. Linear Statics: Volume 1: Basis and Solids (Lecture Notes on Numerical Methods in Engineering and Sciences) (v. 1)

By Eugenio Oñate

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STRUCTURAL ANALYSIS WITH THE FINITE ELEMENT METHOD

Linear Statics

Volume 1 : The Basis and Solids

Eugenio Oñate

The two volumes of this book cover most of the theoretical and computational aspects of the linear static analysis of structures with the Finite Element Method (FEM). The content of the book is based on the lecture notes of a basic course on Structural Analysis with the FEM taught by the author at the Technical University of Catalonia (UPC) in Barcelona, Spain for the last 30 years.

Volume1 presents the basis of the FEM for structural analysis and a detailed description of the finite element formulation for axially loaded bars, plane elasticity problems, axisymmetric solids and general three dimensional solids. Each chapter describes the background theory for each structural model considered, details of the finite element formulation and guidelines for the application to structural engineering problems. The book includes a chapter on miscellaneous topics such as treatment of inclined supports, elastic foundations, stress smoothing, error estimation and adaptive mesh refinement techniques, among others. The text concludes with a chapter on the mesh generation and visualization of FEM results.

The book will be useful for students approaching the finite element analysis of structures for the first time, as well as for practising engineers interested in the details of the formulation and performance of the different finite elements for practical structural analysis.

STRUCTURAL ANALYSIS WITH THE FINITE ELEMENT METHOD

Linear Statics

Volume 2: Beams, Plates and Shells

Eugenio Oñate

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Volume 2 presents a detailed description of the finite element formulation for analysis of slender and thick beams, thin and thick plates, folded plate structures, axisymmetric shells, general curved shells, prismatic structures and three dimensional beams. Each chapter describes the background theory for each structural model considered, details of the finite element formulation and guidelines for the application to structural engineering problems Emphasis is put on the treatment of structures with layered composite materials.

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- Sales Rank: #3953563 in Books
- Published on: 2009-06-12
- Original language: English
- Number of items: 1
- Dimensions: 1.00" h x 6.50" w x 9.70" l, 2.20 pounds
- Binding: Hardcover
- 446 pages

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Editorial Review

Review
From the reviews: "This work, which emphasizes FEA fundamentals and its application in linear structural problems, is the exact book for this audience. … The concise summary presented in the 'concluding remarks' section in each chapter is very helpful and valuable. … Summing Up: Highly recommended. Academic, two-year technical, and professional readers, all levels." (X. Le, Choice, Vol. 47 (8), April, 2010) "This two-volume book presents the results of the author's experience in teaching and research on the finite element method (FEM). The content of the book develops the theory and practical implementation of the FEM for application to linear structural problems. In the first volume, the FEM is described to solve linear elastic problems for solids. … The style of presentation allows the reader to fully comprehend the fundamental steps in a finite element solution process." (Ján Sládek, Zentralblatt MATH, Vol. 1168, 2009)

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