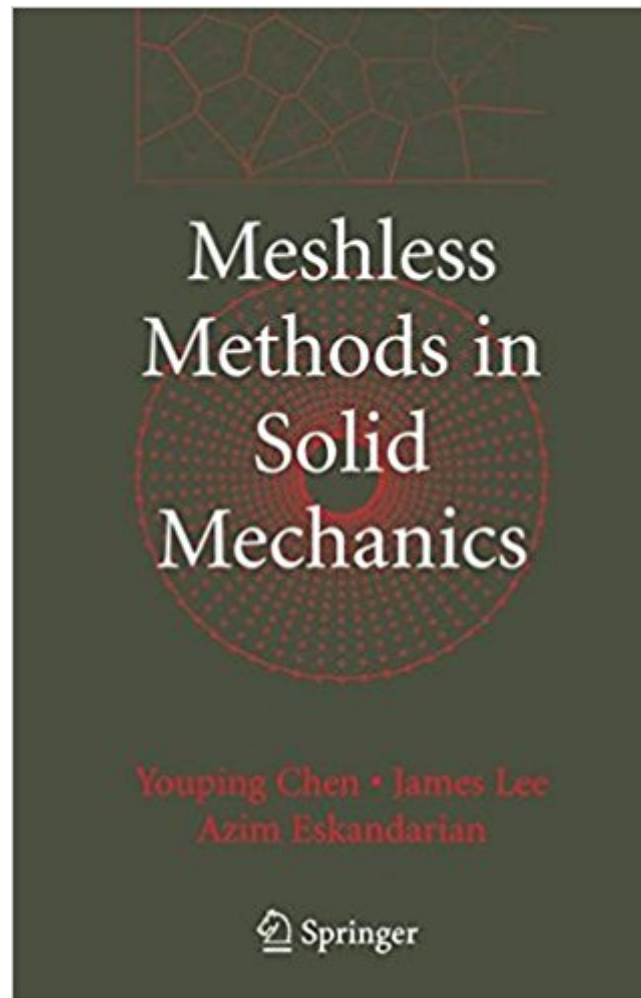




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Meshless Methods In Solid Mechanics



Synopsis

This book covers the fundamentals of continuum mechanics, the integral formulation methods of continuum problems, the basic concepts of finite element methods, and the methodologies, formulations, procedures, and applications of various meshless methods. It also provides general and detailed procedures of meshless analysis on elastostatics, elastodynamics, non-local continuum mechanics and plasticity with a large number of numerical examples. Some basic and important mathematical methods are included in the Appendixes. For readers who want to gain knowledge through hands-on experience, the meshless programs for elastostatics and elastodynamics are provided on an included disc.

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Customer Reviews

From the reviews: "The book can be considered as a textbook for graduate courses on numerical analysis in solid mechanics. It can also be used as a reference book for engineers and scientists who explore the physical world through computer simulations." (Jörn Sändig, Zentralblatt MATH, Vol. 1106 (8), 2007)

Finite element method has been the dominant technique in computational mechanics in the past decades, and it has made significant contributions to the developments in engineering and science. Nevertheless, finite element method is not well suited to problems having severe mesh distortion owing to extremely large deformations of materials, encountering moving discontinuities such as

crack propagation along arbitrary and complex paths, involving considerable meshing and re-meshing in structural optimization problems, or having multidomain of influence in multi-phenomenon physical problems. It is impossible to completely overcome those mesh-related difficulties by a mesh-based method. The highly structured nature of finite element approximations imposes severe penalties in the solutions of those problems. Distinguishing with finite element, finite difference and finite volume methods, meshless method discretizes the continuum body only with a set of nodal points and the approximation is constructed entirely in terms of nodes. There is no need of mesh or elements in this method. It does not possess the mesh related difficulties, eliminates at least part of the FE structure, and provides an approach with more flexibility in the applications in engineering and science. The meshless method started to capture the interest of a broader community of researchers only several years ago, and now it becomes a growing and evolving field. It is showing that this is a very rich area to be explored, and has great promise for many very challenging computational problems. On the one hand, great developments on meshless methods have been achieved. On the other hand, there are many aspects of meshless methods that could benefit from improvements. A broader community of researchers can bring divergent skills and backgrounds to bear on the task of improving this method. The main objective of this book is to provide a textbook for graduate courses on the computational analysis of continuum and solid mechanics based on meshless (also known as mesh free) methods. It can also be used as a reference book for engineers and scientists who are exploring the physical world through computer simulations. Emphasis of this book is given to the understanding of the physical and mathematical characteristics of the procedures of computational solid mechanics. It naturally brings the essence, advantages and challenging problems of meshless methods into the picture. The subjects in this book cover the fundamentals of continuum mechanics, the integral formulation methods of continuum problems, the basic concepts of finite element methods, and the methodologies, formulations, procedures, and applications of various meshless methods. It also provides general and detailed procedures of meshless analysis on elastostatics, elastodynamics, non-local continuum mechanics and plasticity with a large number of numerical examples. Some basic and important mathematical methods are included in the Appendixes. For the readers who want to gain knowledge through hands-on experience, the meshless programs for elastostatics and elastodynamics are also introduced in the book and included in the disc.

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