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Abstract

Introduction to computational mechanics with emphasis on finite element methods and their applications. The transition from the differential equations of ordinary engineering problems is presented, using the weak form allowed by the variational principles or through energy optimization, and through finite element discretization to systems of equations suitable for computer solution. Common solution methods are also be presented. The dynamics of linear problems will be presented in a separate chapter. Extensions of the method to nonlinear problems will also be discussed shortly. Specific practical application topics and extensions to simulation of intelligent structures, optimal design, and discretization improvement methods are briefly discussed. Throughout the book, application examples are presented and programs written in MATLAB/OCTAVE/PYTHON, and information for users who are interested in applications using commercial programs is provided. The book is suitable for an introduction to the method in any undergraduate program of engineering studies but also in related programs of applied mathematics and natural sciences.