Finite Element Modeling of Elastohydrodynamic Lubrication Problems

Wassim Habchi

Finite Element Modeling of Elastohydrodynamic Lubrication Problems offers in-depth chapter coverage of Elastohydrodynamic Lubrication and its FEM Modeling, under Isothermal Newtonian and Generalized-Newtonian conditions with the inclusion of Thermal Effects; Standard FEM Modeling; Advanced FEM Modeling, including Model Order Reduction techniques; and Applications, including an additional chapter on lubrication issues of advanced machines and machines. The book also includes applications of hybrid equilibrium finite elements and model order reduction. The book’s clear and comprehensive guide introduce readers to modern tips and tricks in the modeling of elastohydrodynamic lubrication (EHL) problems. It provides a general framework based on the finite element method (FEM) for dealing with such physical problems of complex engineering and introduces the reader to the fundamentals and key concepts FEM software for the treatment of EHL problems, based on the methodology described in the book. Finite Element Modeling of Elastohydrodynamic Lubrication Problems begins with an introduction to both FEM and EHL, and then covers a variety of modeling applications, ranging from simple to complex problems, to provide readers with the necessary tools to conduct research in this area.


Ted L. Anderson

The Finite Element Method in Heat Transfer and Fluid Dynamics, Third Edition, provides a comprehensive introduction to the finite element method for the solution of problems in heat transfer and fluid dynamics. The book covers the fundamentals of the finite element method, including the formulation of the governing equations, the discretization of the domain, and the solution of the resulting algebraic equations. It also includes advanced topics such as convection-diffusion, Navier-Stokes equations, and inverse problems. The book is intended for readers studying structural mechanics at a higher level. Although it is an ideal companion volume to Volume One: The Basis, this advanced text also functions as a "stand-alone" volume, accessible to those who have been introduced to the fundamental principles on which they are based. The approach that will be taken in this book is to develop the fundamental ideas and methodologies based on an intuitive engineering understanding of the nature and limitations of the finite element approximation and the fundamental behavior of the structure. Misapplication of finite element analysis programs is most likely to arise when the analyst is ignorant of engineering phenomena. In many cases, the analyst is familiar with a specific phenomena, but that the volume of calculations required to solve all but the most trivial of them is such that the assistance of a computer is necessary. As stated above, many questions arise concerning finite element analysis. Some of these questions are best answered by the analyst, others by the software developer, and still others by both. It is highly desirable that the software developer assist the analyst. It will equally become clear that the finite element method is a relatively powerful tool that can be utilized for analysis of structures for which other methods are not available or are poor approximations. Many of the Fortran programs that will be used in this book have been written by the author. The source code for these programs is included on the accompanying CD-ROM. The codes are straightforward implementations of the finite element method and are described here in sufficient detail to enable the reader to understand and modify them as necessary.

Understanding the Finite Element Method

Robert D. Cook

The Finite Element Method is a powerful tool for solving complex engineering problems, but it requires a solid understanding of the underlying mathematics and physics. This book provides a comprehensive introduction to the finite element method, covering the fundamental principles and methods of the method, as well as practical applications in structural and solid mechanics. The book is divided into three parts:

Part I: Foundations of the Finite Element Method
- Introduction to the finite element method
- One-dimensional problems
- Two-dimensional problems

Part II: Solid Mechanics
- Elasticity
- Plasticity
- Localization of plastic strain
- Crack propagation

Part III: Applied Mechanics
- Vibration analysis
- Fluid flow
- Heat transfer

The book is suitable for undergraduate and graduate students in engineering, as well as for practicing engineers who need a refresher on the finite element method. It includes numerous examples and exercises to help readers understand and apply the concepts. The book is available in both print and electronic formats, and it includes a companion website with additional resources and examples. The book is part of the Oxford Series in Electrical, Computer, and Systems Engineering, and it is intended for engineers, scientists, and students who want to learn about the finite element method and its applications to real-world problems.