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Since the original publication of this book, available computer power has increased greatly. Today, scientific computing is playing an ever more prominent role as a tool in scientific discovery and engineering analysis. In this second edition, the key addition is an introduction to the finite element method. This is a widely used technique for solving partial differential equations (PDEs) in complex domains. This text introduces numerical methods and shows how to develop, analyse, and use them. Complete MATLAB programs for all the worked examples are now available at www.cambridge.org/Moin, and more than 30 exercises have been added. This thorough and practical book is intended as a first course in numerical analysis, primarily for new graduate students in engineering and physical science. Along with mastering the fundamentals of numerical methods, students will learn to write their own computer programs using standard numerical methods.

The papers in this volume start with a description of the construction of reduced models through a review of Proper Orthogonal Decomposition (POD) and reduced basis models, including their mathematical foundations and some challenging applications, then followed by a description of a new generation of simulation strategies based on the use of separated representations (space-parameters, space-time, space-time-parameters, space-space,...), which have led to what is known as Proper Generalized Decomposition (PGD) techniques. The models can be enriched by treating parameters as additional coordinates, leading to fast and inexpensive online calculations based on richer offline parametric solutions. Separated representations are analyzed in detail in the course, from their mathematical foundations to their most spectacular applications. It is also shown how such an approximation could evolve into a new paradigm in computational science, enabling one to circumvent various computational issues in a vast array of applications in engineering science.

Now in dynamic full color, SI ENGINEERING FUNDAMENTALS: AN INTRODUCTION TO ENGINEERING, 5e helps students develop the strong problem-solving skills and solid foundation in fundamental principles they will need to become analytical, detail-oriented, and creative engineers. The book opens with an overview of what engineers do, an inside glimpse of the various areas of specialization, and a straightforward look at what it takes to succeed. It then covers the basic physical concepts and laws that students will encounter on the job. Professional Profiles throughout the text highlight the work of practicing engineers from around the globe, tying in the fundamental principles and applying them to professional engineering. Using a flexible, modular format, the book demonstrates how engineers apply physical and chemical laws and principles, as well as mathematics, to design, test, and supervise the production of millions of parts, products, and services that people use every day. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Examines Bureau of Budget, GSA, and National Bureau of Standards electronic data processing systems management programs. Appendix includes report of the President's Science Advisory Committee "Computers in Higher Education" (Feb. 1967, p. 255-337).

This book by a renowned structural engineer offers comprehensive coverage of both static and dynamic analysis of plate behavior, including classical, numerical, and engineering solutions. It contains more than 100 worked examples showing step by step how the various types of analysis are performed.

Structural Health Monitoring (SHM) is the interdisciplinaryengineering field devoted to the monitoring and assessment ofstructural health and integrity. SHM technology integratesnon-destructive evaluation techniques using remote sensing andsmart materials to create smart self-monitoring structurescharacterized by increased reliability and long life. Itsapplications are primarily systems with critical demands concerningperformance where classical

onsite assessment is both difficult andexpensive. Advanced Structural Damage Detection: From Theory toEngineering Applications is written by academic experts in thefield and provides students, engineers and other technicalspecialists with a comprehensive review of recent developments invarious monitoring techniques and their applications to SHM.Contributing to an area which is the subject of intensive researchand development, this book offers both theoretical principles andfeasibility studies for a number of SHM techniques. Key features: Takes a multidisciplinary approach and provides a comprehensivereview of main SHM techniques Presents real case studies and practical application oftechniques for damage detection in different types ofstructures Presents a number of new/novel data processing algorithms Demonstrates real operating prototypes Advanced Structural Damage Detection: From Theory toEngineering Applications is a comprehensive reference forresearchers and engineers and is a useful source of information forgraduate students in mechanical and civil engineering

Computational contact mechanics is a broad topic which bringstogether algorithmic, geometrical, optimization and numericalaspects for a robust, fast and accurate treatment of contactproblems. This book covers all the basic ingredients of contact andcomputational contact mechanics: from efficient contact detectionalgorithms and classical optimization methods to new developmentsin contact kinematics and resolution schemes for both sequentialand parallel computer architectures. The book is self-contained andintended for people working on the implementation and improvementof contact algorithms in a finite element software. Using a new tensor algebra, the authors introduce some originalnotions in contact kinematics and extend the classical formulationof contact elements. Some classical and new resolution methods forcontact problems and associated ready-to-implement expressions areprovided. Contents: 1. Introduction to Computational Contact. 2. Geometry in Contact Mechanics. 3. Contact Detection. 4. Formulation of Contact Problems. 5. Numerical Procedures. 6. Numerical Examples. About the Authors Vladislav A. Yastrebov is a postdoctoral-fellow in ComputationalSolid Mechanics at MINES ParisTech in France. His work incomputational contact mechanics was recognized by the CSMA awardand by the Prix Paul Caseau of the French Academy of Technology andElectricité de France.

An insight into the use of the finite method in geotechnical engineering. The first volume covers the theory and the second volume covers the applications of the subject. The work examines popular constitutive models, numerical techniques and case studies.

The essential introduction to the principles and applications of feedback systems—now fully revised and expanded This textbook covers the mathematics needed to model, analyze, and design feedback systems. Now more user-friendly than ever, this revised and expanded edition of Feedback Systems is a one-volume resource for students and researchers in mathematics and engineering. It has applications across a range of disciplines that utilize feedback in physical, biological, information, and economic systems. Karl Åström and Richard Murray use techniques from physics, computer science, and operations research to introduce control-oriented modeling. They begin with state space tools for analysis and design, including stability of solutions, Lyapunov functions, reachability, state feedback observability, and estimators. The matrix exponential plays a central role in the analysis of linear control systems, allowing a concise development of many of the key concepts for this class of models. Åström and Murray then develop and explain tools in the frequency domain, including transfer functions, Nyquist analysis, PID control, frequency domain design, and robustness. Features a new chapter on design principles and tools, illustrating the types of problems that can be solved using feedback Includes a new chapter on fundamental limits and new material on the Routh-Hurwitz criterion and root locus plots Provides exercises at the end of every chapter Comes with an electronic solutions manual An ideal textbook for undergraduate and graduate students Indispensable for researchers seeking a self-contained resource on control theory

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