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## KEY=AN - KIRK MARSH

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## FRACTURE MECHANICS

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### AN INTRODUCTION

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[Springer Science & Business Media](#) *New developments in the applications of fracture mechanics to engineering problems have taken place in the last years. Composite materials have extensively been used in engineering problems. Quasi-brittle materials including concrete, cement pastes, rock, soil, etc. all benefit from these developments. Layered materials and especially thin film/substrate systems are becoming important in small volume systems used in micro and nanoelectromechanical systems (MEMS and NEMS). Nanostructured materials are being introduced in our every day life. In all these problems fracture mechanics plays a major role for the prediction of failure and safe design of materials and structures. These new challenges motivated the author to proceed with the second edition of the book. The second edition of the book contains four new chapters in addition to the ten chapters of the first edition. The fourteen chapters of the book cover the basic principles and traditional applications, as well as the latest developments of fracture mechanics as applied to problems of composite materials, thin films, nanoindentation and cementitious materials. Thus the book provides an introductory coverage of the traditional and contemporary applications of fracture mechanics in problems of utmost technological importance. With the addition of the four new chapters the book presents a comprehensive treatment of fracture mechanics. It includes the basic principles and traditional applications as well as the new frontiers of research of fracture mechanics during the last three decades in topics of contemporary importance, like composites, thin films, nanoindentation and cementitious materials. The book contains fifty example problems and more than two hundred unsolved problems. A "Solutions Manual" is available upon request for course instructors from the author.*

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### INTRODUCTION TO FRACTURE MECHANICS

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[Elsevier](#) *Introduction to Fracture Mechanics presents an introduction to the origins, formulation and application of fracture mechanics for the design, safe operation and life prediction in structural materials and components. The book introduces and informs the reader on how fracture mechanics works and how it is so different from other forms of analysis that are used to characterize mechanical properties. Chapters cover foundational topics and the use of linear-elastic fracture mechanics, involving both K-based characterizing parameter and G-based energy approaches, and how to characterize the fracture toughness of materials under plane-strain and non plane-strain conditions using the notion of crack-resistance or R-curves. Other sections cover far more complex nonlinear-elastic fracture mechanics based on the use of the J-integral and the crack-tip opening displacement. These topics largely involve continuum mechanics descriptions of crack initiation, slow crack growth, eventual instability by overload fracture, and subcritical cracking. Presents how, for a given material, a fracture toughness value can be measured on a small laboratory sample and then used directly to predict the failure (by fracture, fatigue, creep, etc.) of a much larger structure in service Covers the rudiments of fracture mechanics from the perspective of the philosophy underlying the few principles and the many assumptions that form the basis of the discipline Provides readers with a "working knowledge" of fracture mechanics, describing its potency for damage-tolerant design, for preventing failures through appropriate life-prediction strategies, and for quantitative failure analysis (fracture diagnostics)*

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## FRACTURE MECHANICS

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### FUNDAMENTALS AND APPLICATIONS

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[CRC Press](#) *Since the first edition published in 1991, this has been one of the top-selling books in the field. The first and second editions have been used as a required text in over 100 universities worldwide and have become indispensable reference for thousands of practising engineers as well. The third edition reflects recent advances in the field, although*

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## BASIC FRACTURE MECHANICS

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### INCLUDING AN INTRODUCTION TO FATIGUE

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[Elsevier](#) *BASIC Fracture Mechanics: Including an Introduction to Fatigue discusses the fundamentals of fracture and fatigue. The book presents a series of Beginner's All-purpose Symbolic Instruction Code (BASIC) programs that implement fracture and fatigue methods. The first chapter reviews the BASIC, while the second chapter covers elastic fracture. Chapter 3 deals with the stress intensity factors. The book also tackles the crack tip plasticity and covers crack growth. The last chapter in the text discusses some applications in fracture mechanics. The book will be of great use to engineers who want to get acquainted with fracture mechanics.*

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## FRACTURE MECHANICS

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### WITH AN INTRODUCTION TO MICROMECHANICS

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[Springer Science & Business Media](#) - *self-contained and well illustrated - complete and comprehensive derivation of mechanical/mathematical results with emphasis on issues of practical importance - combines classical subjects of fracture mechanics with modern topics such as microheterogeneous materials, piezoelectric materials, thin films, damage - mechanically and mathematically clear and complete derivations of results*

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### INTRODUCTION TO CONTACT MECHANICS

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[Springer Science & Business Media](#) *Mechanical engineering, an engineering discipline forged and shaped by the needs of the industrial revolution, is once again asked to do its substantial share in the call for industrial renewal. The general call is urgent as we face profound issues of productivity and competitiveness that require engineering solutions. The Mechanical Engineering Series features graduate texts and research monographs intended to address the need for information in contemporary areas of mechanical engineering. The series is conceived as a comprehensive one that covers a broad range of concentrations important to mechanical engineering graduate education and - search. We are fortunate to have a distinguished roster of consulting editors on the advisory board, each an expert in one of the areas of concentration. The names of the consulting editors are listed on the facing page of this volume. The areas of concentration are applied mechanics, biomechanics, computational - chanics, dynamic systems and control, energetics, mechanics of materials, pr- essing, production systems, thermal science, and tribology. Professor Finnie, the consulting editor for mechanics of materials, and I are pleased to present Introduction to Contact Mechanics by Anthony C. Fischer- Cripps.*

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## FRACTURE MECHANICS

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[Hodder Education](#)

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## FRACTURE MECHANICS

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### WITH AN INTRODUCTION TO MICROMECHANICS

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Springer Science & Business Media - self-contained and well illustrated - complete and comprehensive derivation of mechanical/mathematical results with emphasis on issues of practical importance - combines classical subjects of fracture mechanics with modern topics such as microheterogeneous materials, piezoelectric materials, thin films, damage - mechanically and mathematically clear and complete derivations of results

### ADVANCED FRACTURE MECHANICS AND STRUCTURAL INTEGRITY

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CRC Press Advanced Fracture Mechanics and Structural Integrity is organized to cover quantitative descriptions of crack growth and fracture phenomena. The mechanics of fracture are explained, emphasizing elastic-plastic and time-dependent fracture mechanics. Applications are presented, using examples from power generation, aerospace, marine, and chemical industries, with focus on predicting the remaining life of structural components and advanced testing methods for structural materials. Numerous examples and end-of-chapter problems are provided, along with references to encourage further study. The book is written for use in an advanced graduate course on fracture mechanics or structural integrity.

### APPLIED PLASTICITY, SECOND EDITION

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Springer Science & Business Media This book begins with the fundamentals of the mathematical theory of plasticity. The discussion then turns to the theory of plastic stress and its applications to structural analysis. It concludes with a wide range of topics in dynamic plasticity including wave propagation, armor penetration, and structural impact in the plastic range. In view of the rapidly growing interest in computational methods, an appendix presents the fundamentals of a finite-element analysis of metal-forming problems.

### INTRODUCTION TO CONTACT MECHANICS

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Springer Science & Business Media This book deals with the mechanics of solid bodies in contact, a subject intimately connected with such topics as fracture, hardness, and elasticity. Coverage begins with an introduction to the mechanical properties of materials, general fracture mechanics, and the fracture of brittle solids. It then provides a detailed description of indentation stress fields for both elastic and elastic-plastic contact. In addition, the book discusses the formation of Hertzian cone cracks in brittle materials, subsurface damage in ductile materials, and the meaning of hardness. Coverage concludes with an overview of practical methods of indentation testing.

### FRACTURE MECHANICS AND CRACK GROWTH

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John Wiley & Sons This book presents recent advances related to the following two topics: how mechanical fields close to material or geometrical singularities such as cracks can be determined; how failure criteria can be established according to the singularity degrees related to these discontinuities. Concerning the determination of mechanical fields close to a crack tip, the first part of the book presents most of the traditional methods in order to classify them into two major categories. The first is based on the stress field, such as the Airy function, and the second resolves the problem from functions related to displacement fields. Following this, a new method based on the Hamiltonian system is presented in great detail. Local and energetic approaches to fracture are used in order to determine the fracture parameters such as stress intensity factor and energy release rate. The second part of the book describes methodologies to establish the critical fracture loads and the crack growth criteria. Singular fields for homogeneous and non-homogeneous problems near crack tips, v-notches, interfaces, etc. associated with the crack initiation and propagation laws in elastic and elastic-plastic media, allow us to determine the basis of failure criteria. Each phenomenon studied is dealt with according to its conceptual and theoretical modeling, to its use in the criteria of fracture resistance; and finally to its implementation in terms of feasibility and numerical application. Contents 1. Introduction. Part 1: Stress Field Analysis Close to the Crack Tip 2. Review of Continuum Mechanics and the Behavior Laws. 3. Overview of Fracture Mechanics. 4. Fracture Mechanics. 5. Introduction to the Finite Element Analysis of Cracked Structures. Part 2: Crack Growth Criteria 6. Crack Propagation. 7. Crack Growth Prediction in Elements of Steel Structures Submitted to Fatigue. 8. Potential Use of Crack Propagation Laws in Fatigue Life Design.

### FRACTURE MECHANICS

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Springer Science & Business Media Fracture Mechanics is a graduate level text/professional reference that describes the analytical methods used to derive stress and strain functions related to fracture mechanics. The focus of the book will be on modeling and problem solving as tools to be used in interpreting the meaning of a mathematical solution for a particular engineering problem or situation. Once this is accomplished, the reader should be able to think mathematically, foresee metallurgically the significance of microstructural parameters on properties, analyze the mechanical behavior of materials, and recognize realistically how dangerous a crack is in a stressed structure, which may fail catastrophically. This book differs from others in that the subject matter is organized around the modeling and predicating approaches that are used to explain the detrimental effects of crack growth events. Thus, this book will take a more practical approach and make it especially useful as a basic reference for professional engineers.

### FAILURE OF MATERIALS IN MECHANICAL DESIGN

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#### ANALYSIS, PREDICTION, PREVENTION

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John Wiley & Sons Failure of Materials in Mechanical Design

### DESIGN ANALYSIS IN ROCK MECHANICS, SECOND EDITION

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CRC Press This comprehensive introduction to rock mechanics treats the basics of rock mechanics in a clear and straightforward manner and discusses important design problems in terms of the mechanics of materials. This extended second edition includes an additional chapter on rock bursts and bumps, a part on basic dynamics, and numerous additional examples and exercises throughout the chapters. Developed for a complete class in rock engineering, Design Analysis in Rock Mechanics, Second Edition uniquely combines the design of surface and underground rock excavations and addresses: Rock slope stability in surface excavations, from planar block and wedge slides to rotational and toppling failures Shaft and tunnel stability, ranging from naturally supported openings to analysis and design of artificial support and reinforcement systems Entries and pillars in stratified ground Three-dimensional caverns, with an emphasis on cable bolting and backfill Geometry and forces of chimney caving, combination support, and trough subsidence Rock bursts and bumps in underground excavations, with a focus on dynamic phenomena and on fast and sometimes catastrophic failures The numerous exercises and examples familiarize the reader with solving basic practical problems in rock mechanics through various design analysis techniques and their applications. Supporting the main text, appendices provide supplementary information about rock, joint, and composite properties, rock mass classification schemes, useful formulas, and an extensive literature list. The large selection of problems at the end of each chapter can be used for homework assignments. Explanatory and illustrative in character, this volume is suited for courses in rock mechanics, rock engineering and geological engineering design for undergraduate and first-year graduate students in mining, civil engineering, and applied earth sciences. Moreover, it will form a good introduction to the subject of rock mechanics for earth scientists and engineers from other disciplines.

### ANALYTICAL FRACTURE MECHANICS

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Courier Corporation Self-contained treatment supplements standard texts by focusing on analytical methods for determining crack-tip stress and strain fields. Topics include plastic zone transitions, environmental cracking, more. "Recommended." — Applied Mechanics Review.

### INTRODUCTION TO MECHANICAL ENGINEERING

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Springer This textbook fosters information exchange and discussion on all aspects of introductory matters of modern mechanical engineering from a number of perspectives including: mechanical engineering as a profession, materials and manufacturing processes, machining and machine tools, tribology and surface engineering, solid mechanics, applied and computational mechanics, mechanical design, mechatronics and robotics, fluid mechanics and heat transfer, renewable energies, biomechanics, nanoengineering and nanomechanics. At the end of each chapter, a list of 10 questions (and answers) is provided.

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## MECHANICS AND MECHANISMS OF FRACTURE

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### AN INTRODUCTION

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ASM International

### A PRACTICAL APPROACH TO FRACTURE MECHANICS

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*Elsevier* A Practical Approach to Fracture Mechanics provides a concise overview on the fundamental concepts of fracture mechanics, discussing linear elastic fracture mechanics, fracture toughness, ductile fracture, slow crack propagation, structural integrity, and more. The book outlines analytical and experimental methods for determining the fracture resistance of mechanical and structural components, also demonstrating the use of fracture mechanics in failure analysis, reinforcement of cracked structures, and remaining life estimation. The characteristics of crack propagation induced by fatigue, stress-corrosion, creep, and absorbed hydrogen are also discussed. The book concludes with a chapter on the structural integrity analysis of cracked components alongside a real integrity assessment. This book will be especially useful for students in mechanical, civil, industrial, metallurgical, aeronautical and chemical engineering, and for professional engineers looking for a refresher on core principles. Concisely outlines the underlying fundamentals of fracture mechanics, making physical concepts clear and simple and providing easily-understood applied examples Includes solved problems of the most common calculations, along with step-by-step procedures to perform widely-used methods in fracture mechanics Demonstrates how to determine stress intensity factors and fracture toughness, estimate crack growth rate, calculate failure load, and other methods and techniques

### PRACTICAL FRACTURE MECHANICS IN DESIGN

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*CRC Press* Theoretical treatments of fracture mechanics abound in the literature. Among the first books to address this vital topic from an applied standpoint was the first edition of Practical Fracture Mechanics in Design. Completely updated and expanded to reflect recent developments in the field, the second edition of this valuable reference concisely reviews all of the fracture modes and design methodologies needed for control and prevention of structural failures in mechanical components. Practical Fracture Mechanics in Design, Second Edition begins with the historical development of the field, which is critical in understanding the origins and purpose of the various methodologies and equations. The book goes on to provide the fundamentals, basic formulas, elementary worked examples, and references with an emphasis on linear elastic fracture mechanics (LEFM). The author also includes case studies and design problems to clarify the concepts and explain their application. New chapters cover experimental methods in fracture, fracture of composite materials, dynamic fracture, and post mortem analysis of fracture surfaces. Providing much more than a simple introduction to fracture mechanics, this critical, authoritative guide supplies easy-to-use and understand tools based on hands-on experience in design, emphasizing practical applications over heavily theoretical, rigorous mathematical derivations.

### FRACTURE MECHANICS

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### AN INTRODUCTION

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*Springer Nature* This book discusses the basic principles and traditional applications of fracture mechanics, as well as the cutting-edge research in the field over the last three decades in current topics like composites, thin films, nanoindentation, and cementitious materials. Experimental methods play a major role in the study of fracture mechanics problems and are used for the determination of the major fracture mechanics quantities such as stress intensity factors, crack tip opening displacements, strain energy release rates, crack paths, crack velocities in static and dynamic problems. These methods include electrical resistance strain gauges, photoelasticity, interferometry techniques, geometric and interferometry moiré, and the optical method of caustics. Furthermore, numerical methods are often used for the determination of fracture mechanics parameters. They include finite and boundary element methods, Green's function and weight functions, boundary collocation, alternating methods, and integral transforms continuous dislocations. This third edition of the book covers the basic principles and traditional applications, as well as the latest developments of fracture mechanics. Featuring two new chapters and 30 more example problems, it presents a comprehensive overview of fracture mechanics, and includes numerous examples and unsolved problems. This book is suitable for teaching fracture mechanics courses at the undergraduate and graduate levels. A "solutions manual" is available for course instructors upon request.

### MECHANICAL BEHAVIOUR OF MATERIALS

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### VOLUME II: FRACTURE MECHANICS AND DAMAGE

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*Springer Science & Business Media* Designing new structural materials, extending lifetimes and guarding against fracture in service are among the preoccupations of engineers, and to deal with these they need to have command of the mechanics of material behaviour. This ought to reflect in the training of students. In this respect, the first volume of this work deals with elastic, elastoplastic, elastoviscoplastic and viscoelastic behaviours; this second volume continues with fracture mechanics and damage, and with contact mechanics, friction and wear. As in Volume I, the treatment links the active mechanisms on the microscopic scale and the laws of macroscopic behaviour. Chapter I is an introduction to the various damage phenomena. Chapter II gives the essential of fracture mechanics. Chapter III is devoted to brittle fracture, chapter IV to ductile fracture and chapter V to the brittle-ductile transition. Chapter VI is a survey of fatigue damage. Chapter VII is devoted to hydrogen embrittlement and to environment assisted cracking, chapter VIII to creep damage. Chapter IX gives results of contact mechanics and a description of friction and wear mechanisms. Finally, chapter X treats damage in non metallic materials: ceramics, glass, concrete, polymers, wood and composites. The volume includes many explanatory diagrams and illustrations. A third volume will include exercises allowing deeper understanding of the subjects treated in the first two volumes.

### RECENT TRENDS IN FRACTURE AND DAMAGE MECHANICS

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*Springer* This book covers a wide range of topics in fracture and damage mechanics. It presents historical perspectives as well as recent innovative developments, presented by peer reviewed contributions from internationally acknowledged authors. The volume deals with the modeling of fracture and damage in smart materials, current industrial applications of fracture mechanics, and it explores advances in fracture testing methods. In addition, readers will discover trends in the field of local approach to fracture and approaches using analytical mechanics. Scholars in the fields of materials science, engineering and computational science will value this volume which is dedicated to Meinhard Kuna on the occasion of his 65th birthday in 2015. This book incorporates the proceedings of an international symposium that was organized to honor Meinhard Kuna's contributions to the field of theoretical and applied fracture and damage mechanics.

### THE PRACTICAL USE OF FRACTURE MECHANICS

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*Springer Science & Business Media* This book is about the use of fracture mechanics for the solution of practical problems; academic rigor is not at issue and dealt with only in as far as it improves insight and understanding; it often concerns secondary errors in engineering. Knowledge of (ignorance of) such basic input as loads and stresses in practical cases may cause errors far overshadowing those introduced by shortcomings of fracture mechanics and necessary approximations; this is amply demonstrated in the text. I have presented more than three dozen 40-hour courses on fracture mechanics and damage tolerance analysis, so that I have probably more experience in teaching the subject than anyone else. I learned more than the students, and became cognizant of difficulties and of the real concerns in applications. In particular I found, how a subject should be explained to appeal to the practicing engineer to demonstrate that his practical problem can indeed be solved with engineering methods. This experience is reflected in the presentations in this book. Sufficient background is provided for an understanding of the issues, but pragmatism prevails. Mathematics cannot be avoided, but they are presented in a way that appeals to insight and intuition, in lieu of formal derivations which would show but the mathematical skill of the writer.

### IUTAM SYMPOSIUM ON ELASTOHYDRODYNAMICS AND MICRO-ELASTOHYDRODYNAMICS

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### PROCEEDINGS OF THE IUTAM SYMPOSIUM HELD IN CARDIFF, UK, 1-3 SEPTEMBER 2004

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*Springer Science & Business Media* This volume contains the proceedings of the IUTAM Symposium on Elastohydrodynamics and Microelastohydrodynamics held in Cardiff from 1-3 September 2004. It contains 31 articles by leading researchers in the field. The symposium focused on theoretical, experimental and computational issues in elastohydrodynamic lubrication (EHL) both in relation to smooth surfaces and in situations where the film is of the same order or thinner than the surface roughness (micro-EHL). The last IUTAM Symposium in this general area of contact of deformable bodies was in 1974. The emphasis in the Symposium was upon fundamental issues such as: solution methods; lubricant rheological models, thermal effects; both low and high elastic modulus situations; human and replacement joints; fluid traction; dynamic effects, asperity lubrication and the failure of

lubrication; surface fatigue and thermal distress under EHL conditions. The book will be useful to those active in basic elasto-hydrodynamics research who wish to gain an up-to-date understanding of the subject from leading experts in the field.

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### **NUMERICAL ASSESSMENTS OF CRACKS IN ELASTIC-PLASTIC MATERIALS**

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**Springer Science & Business Media** In this book a systematic discussion of crack problems in elastic-plastic materials is presented. The state of the art in fracture mechanics research and assessment of cracks is documented, with the help of analytic, asymptotic methods as well as finite element computations. After a brief introduction to fracture mechanics, the two-parameter concept for stationary cracks is studied in addition to the issues in three-dimensional crack fields under coupling with strong out-of-plane effects. Cracks along interfaces and crack growth problems under mixed mode conditions are also treated. A systematic study of stress singularities for different notches is accompanied by detailed finite element computations.

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### **GEOLOGIC FRACTURE MECHANICS**

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**Cambridge University Press** Introduction to geologic fracture mechanics covering geologic structural discontinuities from theoretical and field-based perspectives.

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### **MASTERING CALCULATIONS IN LINEAR AND NONLINEAR MECHANICS**

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**Springer Science & Business Media** This book deals with the management of calculations in linear and nonlinear mechanics. Particular attention is given to error estimators and indicators for structural analysis. The accent is on the concept of error in constitutive relation. An important part of the work is also devoted to the utilization of the error estimators involved in a calculation, beginning with the parameters related to the mesh. Many of the topics are taken from the most recent research by the authors: local error estimators, extension of the concept of error in constitutive relation to nonlinear evolution problems and dynamic problems, adaptive improvement of calculations in nonlinear mechanics. This work is intended for all those interested in mechanics: students, researchers and engineers concerned with the construction of models as well as their simulation for industrial purposes.

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### **INTRODUCTION TO FRACTURE MECHANICS**

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#### **FRACTURE MECHANICS, SECOND EDITION**

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#### **FUNDAMENTALS AND APPLICATIONS**

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**CRC Press** This book covers both theoretical and practical aspects of fracture mechanics and integrates materials science with solid mechanics.

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### **INTRODUCTION TO CONTINUUM DAMAGE MECHANICS**

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**Springer Science & Business Media** Modern engineering materials subjected to unfavorable mechanical and environmental conditions decrease in strength due to the accumulation of microstructural changes. For example, considering damage in metals we can mention creep damage, ductile plastic damage, embrittlement of steels and fatigue damage. To properly estimate the value of damage when designing reliable structures it is necessary to formulate the damage phenomenon in terms of mechanics. Then it is possible to analyse various engineering problems using analytical and computational techniques. During the last two decades the basic principles of continuum damage mechanics were formulated and some special problems were solved. Many scientific papers were published and several conferences on damage mechanics took place. Now continuum damage mechanics is rapidly developing branch of fracture mechanics. This book is probably the first one on the subject; it contains a systematic description of the basic aspects of damage mechanics and some of its applications. In general, a theoretical description of damage can be rather complicated. The experiments in this field are difficult (especially under multiaxial stress and non-proportional loading). Therefore, experimental data, as a rule, are scarce. Determination of functions and constants, which play a role in the complex variants of the theory, from available experimental data is often practically impossible. ix L.M. Kachanov The problems of damage mechanics are mainly engineering ones. Therefore, the author tries to avoid superfluous mathematical formalism. Some more details of the book's subject can be found in the list of contents.

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### **VIBRATION DYNAMICS AND CONTROL**

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**Springer Science & Business Media** Mechanical engineering, and engineering discipline born of the needs of the industrial revolution, is once again asked to do its substantial share in the call for industrial renewal. The general call is urgent as we face profound issues of productivity and competitiveness that require engineering solutions, among others. The Mechanical Engineering Series is a series featuring graduate texts and research monographs intended to address the need for information in contemporary areas of mechanical engineering. The series is conceived as a comprehensive one that covers a broad range of concentrations important to mechanical engineering graduate education and research. We are fortunate to have a distinguished roster of series editors, each an expert in one of the areas of concentration. The names of the series editors are listed on page vi of this volume. The areas of concentration are applied mechanics, biomechanics, computational mechanics, dynamic systems and control, energetics, mechanics of materials, processing, thermal science, and tribology. Preface After 15 years since the publication of *Vibration of Structures and Machines* and three subsequent editions a deep reorganization and updating of the material was felt necessary. This new book on the subject of Vibration dynamics and control is organized in a larger number of shorter chapters, hoping that this can be helpful to the reader. New material has been added and many points have been updated. A larger number of examples and of exercises have been included.

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### **FRACTURE MECHANICS**

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**Springer Science & Business Media** Fracture mechanics is a vast and growing field. This book develops the basic elements needed for both fracture research and engineering practice. The emphasis is on continuum mechanics models for energy flows and crack-tip stress- and deformation fields in elastic and elastic-plastic materials. In addition to a brief discussion of computational fracture methods, the text includes practical sections on fracture criteria, fracture toughness testing, and methods for measuring stress intensity factors and energy release rates. Class-tested at Cornell, this book is designed for students, researchers and practitioners interested in understanding and contributing to a diverse and vital field of knowledge.

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### **TRANSFERABILITY OF FRACTURE MECHANICAL CHARACTERISTICS**

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**Springer Science & Business Media** Five laboratories from France, Hungary and the Czech Republic have solved a Project supported financially by NATO within the Science for Peace Program (under Nr. 972655) for three years. The project, titled *Fracture Resistance of Steels for Containers of Spent Nuclear Fuel*, was focused (i) on the generation of data needed for the qualification procedure of a new container introduced by Skoda Nuclear Machinery and (ii) on a number of topics of scientific nature associated with the interesting field of transferability of fracture mechanical data-. It has been found during numerous conference presentations of project results that the knowledge developed within the project would be more attractive when published in a more comprehensive form. This was the reason why the final project workshop was arranged as a meeting of project collaborators and contributing invited experts working in very similar field. The main scope of the final project workshop, titled *Transferability of Fracture Mechanical Data* and held in Brno from 5 to 6 November 2001, was to bring together project collaborators with a number of invited international experts, both covering the spectrum of topics solved within the project and reviewing the project results in the presence of these specialists. A total of 34 colleagues from 7 European countries and the USA participated in the workshop.

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### **FRACTURE MECHANICS OF ROCK**

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**Elsevier** The analysis of crack problems through fracture mechanics has been applied to the study of materials such as glass, metals and ceramics because relatively simple fracture criteria describe the failure of these materials. The increased attention paid to experimental rock fracture mechanics has led to major contributions to the solving of geophysical problems. The text presents a concise treatment of the physics and mathematics of a representative selection of problems from areas such as earthquake mechanics and prediction, hydraulic fracturing, hot dry rock geothermal energy, fault mechanics, and dynamic fragmentation.

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### **FRACTURE MECHANICS OF CONCRETE**

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## APPLICATIONS OF FRACTURE MECHANICS TO CONCRETE, ROCK AND OTHER QUASI-BRITTLE MATERIALS

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**John Wiley & Sons** *FRACTURE MECHANICS OF CONCRETE AND ROCK* This book offers engineers a unique opportunity to learn, from internationally recognized leaders in their field, about the latest theoretical advances in fracture mechanics in concrete, reinforced concrete structures, and rock. At the same time, it functions as a superb, graduate-level introduction to fracture mechanics concepts and analytical techniques. Reviews, in depth, the basic theory behind fracture mechanics \* Covers the application of fracture mechanics to compression failure, creep, fatigue, torsion, and other advanced topics \* Extremely well researched, applies experimental evidence of damage to a wide range of design cases \* Supplies all relevant formulas for stress intensity \* Covers state-of-the-art linear elastic fracture mechanics (LEFM) techniques for analyzing deformations and cracking \* Describes nonlinear fracture mechanics (NLFM) and the latest RILEM modeling techniques for testing nonlinear quasi-brittle materials \* And much more Over the past few years, researchers employing techniques borrowed from fracture mechanics have made many groundbreaking discoveries concerning the causes and effects of cracking, damage, and fractures of plain and reinforced concrete structures and rock. This, in turn, has resulted in the further development and refinement of fracture mechanics concepts and tools. Yet, despite the field's growth and the growing conviction that fracture mechanics is indispensable to an understanding of material and structural failure, there continues to be a surprising shortage of textbooks and professional references on the subject. Written by two of the foremost names in the field, *Fracture Mechanics of Concrete* fills that gap. The most comprehensive book ever written on the subject, it consolidates the latest theoretical research from around the world in a single reference that can be used by students and professionals alike. *Fracture Mechanics of Concrete* is divided into two sections. In the first, the authors lay the necessary groundwork with an in-depth review of fundamental principles. In the second section, the authors vividly demonstrate how fracture mechanics has been successfully applied to failures occurring in a wide array of design cases. Key topics covered in these sections include: \* State-of-the-art linear elastic fracture mechanics (LEFM) techniques for analyzing deformations and cracking \* Nonlinear fracture mechanics (NLFM) and the latest RILEM modeling techniques for testing nonlinear quasi-brittle materials \* The use of R-Curves to describe cracking and fracture in quasi-brittle materials \* The application of fracture mechanics to compression failure, creep, fatigue, torsion, and other advanced topics The most timely, comprehensive, and authoritative book on the subject currently available, *Fracture Mechanics of Concrete* is both a complete instructional tool for academics and students in structural and geotechnical engineering courses, and an indispensable working resource for practicing engineers.

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## MECHANICS OF HYDRAULIC FRACTURING

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**Gulf Professional Publishing** Revised to include current components considered for today's unconventional and multi-fracture grids, *Mechanics of Hydraulic Fracturing, Second Edition* explains one of the most important features for fracture design — the ability to predict the geometry and characteristics of the hydraulically induced fracture. With two-thirds of the world's oil and natural gas reserves committed to unconventional resources, hydraulic fracturing is the best proven well stimulation method to extract these resources from their more remote and complex reservoirs. However, few hydraulic fracture models can properly simulate more complex fractures. Engineers and well designers must understand the underlying mechanics of how fractures are modeled in order to correctly predict and forecast a more advanced fracture network. Updated to accommodate today's fracturing jobs, *Mechanics of Hydraulic Fracturing, Second Edition* enables the engineer to: Understand complex fracture networks to maximize completion strategies Recognize and compute stress shadow, which can drastically affect fracture network patterns Optimize completions by properly modeling and more accurately predicting for today's hydraulic fracturing completions Discusses the underlying mechanics of creating a fracture from the wellbore Enhanced to include newer modeling components such as stress shadow and interaction of hydraulic fracture with a natural fracture, which aids in more complex fracture networks Updated experimental studies that apply to today's unconventional fracturing cases

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## APPLICATION OF FRACTURE MECHANICS TO COMPOSITE MATERIALS

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**Elsevier** This multi-author volume provides a useful summary of current knowledge on the application of fracture mechanics to composite materials. It has been written to fill the gap between the literature on fundamental principles of fracture mechanics and the special publications on the fracture properties of conventional materials, such as metals, polymers and ceramics. The data are represented in the form of about 420 figures (including diagrams, schematics and photographs) and 80 tables. The author index covers more than 500 references, and the subject index more than 1000 key words.

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## THE PRACTICAL USE OF FRACTURE MECHANICS

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**Springer** This book is about the use of fracture mechanics for the solution of practical problems; academic rigor is not at issue and dealt with only in as far as it improves insight and understanding; it often concerns secondary errors in engineering. Knowledge of (ignorance of) such basic input as loads and stresses in practical cases may cause errors far overshadowing those introduced by shortcomings of fracture mechanics and necessary approximations; this is amply demonstrated in the text. I have presented more than three dozen 40-hour courses on fracture mechanics and damage tolerance analysis, so that I have probably more experience in teaching the subject than anyone else. I learned more than the students, and became cognizant of difficulties and of the real concerns in applications. In particular I found, how a subject should be explained to appeal to the practicing engineer to demonstrate that his practical problem can indeed be solved with engineering methods. This experience is reflected in the presentations in this book. Sufficient background is provided for an understanding of the issues, but pragmatism prevails. Mathematics cannot be avoided, but they are presented in a way that appeals to insight and intuition, in lieu of formal derivations which would show but the mathematical skill of the writer.

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## FRACTURE MECHANICS, SECOND EDITION

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**CRC Press** Since the first edition published in 1991, this has been one of the top-selling books in the field. The first and second editions have been used as a required text in over 100 universities worldwide and have become indispensable reference for thousands of practicing engineers as well. The third edition reflects recent advances in the field, although it still retains the characteristics that made it a best-selling title. Providing thorough coverage of a wide range of topics, this book covers both theoretical and practical aspects of fracture mechanics and integrates materials science with solid mechanics. This edition includes expanded coverage of weight functions and a new chapter on environmental cracking.