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Mechanical Behaviour of Materials: Volume II: Fracture Mechanics and Damage. Dominique François, André Pineau, André Zaoui (auth.) 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.

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Each chapter is devoted to one of the major classes of material behaviour. As the subtitles indicate, Volume 1 deals with micro- and macroscopic constitutive behaviour and Volume 2 with damage and fracture mechanics. A third volume will be devoted to exercises and their full solutions complementing the content of these two first volumes.

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Mechanical Behaviour of Materials - Volume II: Fracture ...

Mechanical Behaviour of Materials: Volume 1: Micro- and Macroscopic Constitutive Behaviour Dominique François , André Pineau , André Zaoui (auth.) Advances in technology are demanding ever-increasing mastery over the materials being used: the challenge is to gain a better understanding of their behaviour, and more particularly of the relations between their microstructure and their macroscopic properties.

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Advances in technology are demanding ever-increasing mastery over the materials being used: the challenge is to gain a better understanding of their

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behaviour, and more particularly of the relations between their microstructure and their macroscopic properties. This work, of which this is the first volume, aims to provide the means by which this challenge may be met. Starting from the mechanics of deformation, it develops the laws governing macroscopic behaviour – expressed as the constitutive equations – always taking account of the physical phenomena which underlie rheological behaviour. The most recent developments are presented, in particular those concerning heterogeneous materials such as metallic alloys, polymers and composites. Each chapter is devoted to one of the major classes of material behaviour. As the subtitles indicate, Volume 1 deals with micro- and macroscopic constitutive behaviour and Volume 2 with damage and fracture mechanics. A third volume will be devoted to exercises and their full solutions complementing the content of these two first volumes. Most of the chapters end with a set of exercises, to many of which either the full solution or hints on how to obtain this are given; each volume is profusely illustrated with explanatory diagrams and with electron-microscope photographs. This book, now in its second edition, has been rigorously re-written, updated and modernised for a new generation. The authors improved the existing material, in particular in modifying the organisation, and added new up-to-date content. Understanding the subject matter requires a good knowledge of solid mechanics and materials science; the main elements of these fields are given in a set of annexes at the end of the first volume. The authors also thought it interesting for the readers to give as footnotes some information about the many scientists whose names are attached to theories and formulae and whose memories must be celebrated. Whilst the present book, as well as Volume 2, is addressed primarily to graduate students, part of it can be used in undergraduate courses; and it is hoped that practising engineers and scientists will find the information it conveys useful. It is the authors' hope also that English-speaking readers will want to learn about the aspects of French culture, and more particularly of the French school of micromechanics of materials, which this treatment undoubtedly displays.

This monograph consists of two volumes and provides a unified, comprehensive presentation of the important topics pertaining to the understanding and determination of the mechanical behaviour of engineering materials under different regimes of loading. The large subject area is separated into eighteen chapters and four appendices, all self-contained, which give a complete picture and allow a thorough understanding of the current status and future direction of individual topics. Volume I contains eight chapters and three appendices, and concerns itself with the basic concepts pertaining to the entire monograph, together with the response behaviour of engineering materials under static and quasi-static loading. Thus, Volume I is dedicated to the introduction, the basic concepts and principles of the mechanical response of engineering materials, together with the relevant analysis of elastic, elastic-plastic, and viscoelastic behaviour. Volume II consists of ten chapters and one appendix, and concerns itself with the mechanical behaviour of various classes of materials under dynamic loading, together with the effects of local and microstructural phenomena on the response behaviour of the material. Volume II also contains selected topics concerning intelligent material systems, and pattern recognition and classification methodology for the characterization of material response states. The monograph contains a large number of illustrations, numerical examples and solved problems. The majority of chapters also contain a large number of review problems to challenge the reader. The monograph can be used as a textbook in science and engineering, for third and fourth undergraduate levels, as well as for the graduate levels. It is also a definitive reference work for scientists and engineers involved in the production, processing and applications of engineering materials, as well as for other professionals who are involved in the engineering design process.

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. The first volume of this two-volume work deals with elastic and elastoplastic behaviour; this second volume continues with viscoelasticity, damage, fracture (resistance to cracking) and contact mechanics. As in Volume I, the treatment starts from the active mechanisms on the microscopic scale and develops the laws of macroscopic behaviour. Chapter I deals with viscoplastic

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behaviour, as shown, for example, at low temperatures by the effects of oscillatory loads and at high temperatures by creep under steady load. Chapter 2 treats damage phenomena encountered in all materials - for example, metals, polymers, glasses, concretes - such as cavitation, fatigue and stress-corrosion cracking. Chapter 3 treats those concepts of fracture mechanics that are needed for the understanding of resistance to cracking and Chapter 4 completes the volume with a survey of the main concepts of contact mechanics. As with Volume I, each chapter has a set of exercises, either with solutions or with indications of how to attack the problem; and there are many explanatory diagrams and other illustrations.

One of the most important subjects for any student of engineering to master is the behaviour of materials and structures under load. The way in which they react to applied forces, the deflections resulting and the stresses and strains set up in the bodies concerned are all vital considerations when designing a mechanical component such that it will not fail under predicted load during its service lifetime. All the essential elements of a treatment of these topics are contained within this course of study, starting with an introduction to the concepts of stress and strain, shear force and bending moments and moving on to the examination of bending, shear and torsion in elements such as beams, cylinders, shells and springs. A simple treatment of complex stress and complex strain leads to a study of the theories of elastic failure and an introduction to the experimental methods of stress and strain analysis. More advanced topics are dealt with in a companion volume - Mechanics of Materials 2. Each chapter contains a summary of the essential formulae which are developed in the chapter, and a large number of worked examples which progress in level of difficulty as the principles are enlarged upon. In addition, each chapter concludes with an extensive selection of problems for solution by the student, mostly examination questions from professional and academic bodies, which are graded according to difficulty and furnished with answers at the end. * Emphasis on practical learning and applications, rather than theory * Provides the essential formulae for each individual chapter * Contains numerous worked examples and problems

Advances in technology are demanding ever-increasing mastery over the materials being used: the challenge is to gain a better understanding of their behaviour, and more particularly of the relations between their microstructure and their macroscopic properties. This two-volume work, of which this is the first volume, aims to provide the means by which this challenge may be met. Starting from the mechanics of deformation, it develops the laws governing macroscopic behaviour - expressed as the constitutive equations - always taking account of the physical phenomena which underlie rheological behaviour. The most recent developments are presented, in particular those concerning heterogeneous materials such as metallic alloys, polymers and composites. Each chapter is devoted to one of the major classes of material behaviour. As the subtitles indicate, Volume I deals with elasticity and plasticity and Volume II with viscoelasticity, viscoplasticity, damage phenomena, and the mechanics of fracture and of contact. Annexes to Volume I give the relevant basic tools and techniques of continuous-media mechanics, crystallography and phase changes. Most of the chapters end with a set of exercises, to many of which either the full solution or hints on how to obtain this are given; each volume is profusely illustrated with explanatory diagrams and with electron-microscope photographs. Mechanics of Material Behaviour grew out of the Paris Diplome d'Études Approfondies (DEA, Advanced Studies Diploma) in Mechanics and Materials. In addition to Diploma-level students, it is addressed to students reading for a first degree in engineering, practising engineers and research workers in this field. The treatment is mathematical but the mathematical arguments should not prove difficult; the real difficulties of the subject stem from the frequent and considerable changes of scale that have to be appreciated and the need to acquire a firm grasp of the underlying physics.

A balanced mechanics-materials approach and coverage of the latest developments in biomaterials and electronic materials, the new edition of this popular text is the most thorough and modern book available for upper-level undergraduate courses on the mechanical behavior of materials. To ensure that the

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student gains a thorough understanding the authors present the fundamental mechanisms that operate at micro- and nano-meter level across a wide-range of materials, in a way that is mathematically simple and requires no extensive knowledge of materials. This integrated approach provides a conceptual presentation that shows how the microstructure of a material controls its mechanical behavior, and this is reinforced through extensive use of micrographs and illustrations. New worked examples and exercises help the student test their understanding. Further resources for this title, including lecture slides of select illustrations and solutions for exercises, are available online at www.cambridge.org/97800521866758.

This monograph consists of two volumes and provides a unified, comprehensive presentation of the important topics pertaining to the understanding and determination of the mechanical behaviour of engineering materials under different regimes of loading. The large subject area is separated into eighteen chapters and four appendices, all self-contained, which give a complete picture and allow a thorough understanding of the current status and future direction of individual topics. Volume I contains eight chapters and three appendices, and concerns itself with the basic concepts pertaining to the entire monograph, together with the response behaviour of engineering materials under static and quasi-static loading. Thus, Volume I is dedicated to the introduction, the basic concepts and principles of the mechanical response of engineering materials, together with the relevant analysis of elastic, elastic-plastic, and viscoelastic behaviour. Volume II consists of ten chapters and one appendix, and concerns itself with the mechanical behaviour of various classes of materials under dynamic loading, together with the effects of local and microstructural phenomena on the response behaviour of the material. Volume II also contains selected topics concerning intelligent material systems, and pattern recognition and classification methodology for the characterization of material response states. The monograph contains a large number of illustrations, numerical examples and solved problems. The majority of chapters also contain a large number of review problems to challenge the reader. The monograph can be used as a textbook in science and engineering, for third and fourth undergraduate levels, as well as for the graduate levels. It is also a definitive reference work for scientists and engineers involved in the production, processing and applications of engineering materials, as well as for other professionals who are involved in the engineering design process.

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Provides comprehensive treatment of the mechanical behavior of materials within a balanced mechanics-materials approach. Covering a range of materials, including metals, polymers, ceramics, and composites, this book presents the properties of materials while addressing the principal ideas behind theories of mechanical behavior. It includes broad treatment of flow and fracture criteria. It presents various mechanisms for tailoring the strength and toughness of

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materials. It also provides references and a list of suggested readings in each chapter. A valuable reference book on the mechanical behavior of materials for all practicing Mechanical and Materials Engineers.

Dynamic Behavior of Materials, Volume 1 of the Proceedings of the 2020 SEM Annual Conference & Exposition on Experimental and Applied Mechanics, the first volume of seven from the Conference, brings together contributions to this important area of research and engineering. The collection presents early findings and case studies on fundamental and applied aspects of Experimental Mechanics, including papers on: Synchrotron Applications/Advanced Dynamic Imaging Quantitative Visualization of Dynamic Events Novel Experimental Techniques Dynamic Behavior of Geomaterials Dynamic Failure & Fragmentation Dynamic Response of Low Impedance Materials Hybrid Experimental/Computational Studies Shock and Blast Loading Advances in Material Modeling Industrial Applications.

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