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Fatigue has long been recognized as a mechanism that can provoke catastrophic material failure in structural applications and researchers are now turning to the development of prediction tools in order to reduce the cost of determining design criteria for any new material. Fatigue of Fiber-reinforced Composites explains these highly scientific subjects in a simple yet thorough way. Fatigue behavior of fiber-reinforced composite materials and structural components is described through the presentation of numerous experimental results. Many examples help the reader to visualize the failure modes of laminated composite materials and structural adhesively bonded joints. Theoretical models, based on these experimental data, are demonstrated and their capacity for fatigue life modeling and prediction is thoroughly assessed. Fatigue of Fiber-reinforced Composites gives the reader the opportunity to learn about methods for modeling the fatigue behavior of fiber-reinforced composites, about statistical analysis of experimental data, and about theories for life prediction under loading patterns that produce multiaxial fatigue stress states. The authors combine these theories to establish a complete design process that is able to predict fatigue life of fiber-reinforced composites under multiaxial, variable amplitude stress states. A classic design methodology is presented for demonstration and theoretical predictions are compared to experimental data from typical material systems used in the wind turbine rotor blade industry. Fatigue of Fiber-reinforced Composites also presents novel computational methods for modeling fatigue behavior of composite materials, such as artificial neural networks and genetic programming, as a promising alternative to the conventional methods. It is an ideal source of information for researchers and graduate students in mechanical engineering, civil engineering and materials science.

Braided fabrics are made by interlacing yarns or strips of fabric. Braiding produces a wide range of structures for technical textile applications from medical sutures to cables for anchoring ships. Written by one of the world's leading experts in the field, the book reviews the basic principles, design and processes used in braiding. The book also discusses specialised braiding techniques such as spiral braiding and lace technology. Provides a solid foundation in the fundamentals of braiding design, processes and machinery Covers the patterning of braided products and the structural and colour design of both flat and tubular braids Reviews maypole braiding machines and mechanics

The use of polymer composites in various engineering applications has become state of the art. This multi-author volume provides a useful summary of updated knowledge on polymer composites in general, practically integrating experimental studies, theoretical analyses and computational modeling at different scales, i. e. , from nano- to macroscale. Detailed consideration is given to four major areas: structure and properties of polymer nanocomposites, characterization and modeling, processing and application of macrocomposites, and mechanical performance of macrocomposites. The idea to organize this volume arose from a very impressive workshop - The First International Workshop on Polymers and Composites at IVW Kaiserslautern: Invited Humboldt-Fellows and Distinguished Scientists, which was held on May 22-24,2003 at the University of Kaiserslautern, Germany. The contributing authors were invited to incorporate updated knowledge and developments into their individual chapters within a year after the workshop, which finally led to these excellent contributions. The success of

this workshop was mainly sponsored by the German Alexander von Humboldt Foundation through a Sofia Kovalevskaja Award Program, financed by the Federal Ministry for Education and Research within the "Investment in the Future Program" of the German Government. In 2001, the Humboldt Foundation launched this new award program in order to offer outstanding young researchers throughout the world an opportunity to establish their own work-groups and to develop innovative research concepts virtually in Germany. One of the editors, Z. Advanced fibre-reinforced polymer (FRP) composites have become essential materials for the building of new structures and for the repair of existing infrastructure. Advanced fibre-reinforced polymer (FRP) composites for structural applications provides an overview of different advanced FRP composites and the use of these materials in a variety of application areas. Part one introduces materials used in the creation of advanced FRP composites including polyester, vinylester and epoxy resins. Part two goes on to explore the processing and fabrication of advanced FRP composites and includes chapters on prepreg processing and filament winding processes. Part three highlights properties of advanced FRP composites and explores how performance can be managed and tested. Applications of advanced FRP composites, including bridge engineering, pipe rehabilitation in the oil and gas industry and sustainable energy production, are discussed in part four. With its distinguished editor and international team of expert contributors, Advanced fibre-reinforced polymer (FRP) composites for structural applications is a technical resource for researchers and engineers using advanced FRP composites, as well as professionals requiring an understanding of the production and properties of advanced FRP composites, and academics interested in this field. Provides an overview of different advanced FRP composites and the use of these materials in a variety of application areas Introduces materials used in the creation of advanced FRP composites including polyester, vinylester and epoxy resins Explores the processing and fabrication of advanced FRP composites and includes chapters on prepreg processing and filament winding processes

Acting Principles of Nano-Scaled Matrix Additives for Composite Structures Springer Nature

The book explores the effect of nanoscale matrix additives along the four levels of material formation, particle-resin interaction, the influence of nanoparticles on the processability of the polymer, the influence of nanoparticles on polymer curing and the influence of nanoparticles on the fiber plastic composite. Fiber-reinforced plastics have a significantly higher lightweight construction potential in components with a primary single- or biaxial stress state compared to isotropic metals. At the same time, their insensitivity to corrosion and their advantageous fatigue properties can help to reduce maintenance costs. Due to their outstanding specific mechanical properties, they are among today's high-performance lightweight construction materials. These properties make them particularly attractive in the field of mobility. However, as soon as the matrix properties dominate the mechanical properties, e.g. in the case of fibre-parallel compressive strength, significant weaknesses become apparent in the mechanical properties. Here, one approach is to significantly increase the matrix properties through nanoscale ceramic additives and at the same time to guarantee the processability of the resin.

Composite structures are most efficient in performance and production cost when combined with smart materials making them adaptable to changing operational conditions. The specific production processes of composites offer the possibility to integrate more functions thus making the structure more valuable. Active functions can be realized by smart materials, e.g. morphing, active vibration control, active structure acoustic control or structure health monitoring. The foundation is a

sound understanding of materials, design methods, design principles, production technologies and adaptronics. Along the complete process chain these disciplines together deliver advanced lightweight solutions for applications ranging from mechanical engineering to vehicles, airframe and finally space structures. This book provides the scientific foundations as well as inspiring new ideas for engineers working in the field of composite lightweight structures.

The methodology for designing high-performance composite structures is still evolving. The complexity of the response of composite materials and the difficulties in predicting the composite material properties from the basic properties of the constituents result in the need for a well-planned and exhaustive test program. The recommended practice to mitigate the technological risks associated with advanced composite materials is to substantiate the performance and durability of the design in a sequence of steps known as the Building Block Approach. The Building Block Approach ensures that cost and performance objectives are met by testing greater numbers of smaller, less expensive specimens. In this way, technology risks are assessed early in the program. In addition, the knowledge acquired at a given level of structural complexity is built up before progressing to a level of increased complexity. Achieving substantiation of structural performance by testing alone can be prohibitively expensive because of the number of specimens and components required to characterize all material systems, loading scenarios and boundary conditions. Building Block Approach programs can achieve significant cost reductions by seeing a synergy between testing and analysis. The more the development relies on analysis, the less expensive it becomes. The use of advanced computational models for the prediction of the mechanical response of composite structures can replace some of the mechanical tests and can significantly reduce the cost of designing with composites while providing to the engineers the information necessary to achieve an optimized design.

This practical handbook covers the diagnosis and management of fractures in adults and children. Each chapter is organized as follows: Epidemiology, Anatomy, Mechanism of Injury, Clinical Evaluation, Radiologic Evaluation, Classification, treatment, Complications. Section 1 also covers Multiple Trauma, Gunshot Wounds, pathologic and periprosthetic fractures, and orthopedic analgesia. The new edition will be in full color and will include a new chapter on the basic science of fracture healing, as well as a new section on intraoperative imaging. Features: Bulleted format allows quick access and easy reading Consistent format for targeted reading Covers adult and pediatric fractures Covers fractures in all anatomic areas Heavily illustrated Portable In Full color New chapter: Basic Science of Fracture Healing New Section: Intraoperative Imaging

With the constant evolution of implant technology, and improvement in the production of allograft and bone substitutes, the armamentarium of the orthopaedic surgeon has significantly expanded. In particular, the recent involvement of nanotechnologies opens up the possibilities of new approaches in the interactive interfaces of implants. With many important developments

occurring since the first edition of this well-received book, this updated resource informs orthopaedic practitioners on a wide range of biomechanical advances in one complete reference guide. Biomechanics and Biomaterials in Orthopedics, 2nd edition compiles the most prominent work in the discipline to offer newly-qualified orthopedic surgeons a summary of the fundamental skills that they will need to apply in their day-to-day work, while also updating the knowledge of experienced surgeons. This book covers both basic concepts concerning biomaterials and biomechanics as well as their clinical application and the experience from everyday practical use. This book will be of great value to specialists in orthopedics and traumatology, while also providing an important basis for graduate and postgraduate learning.

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