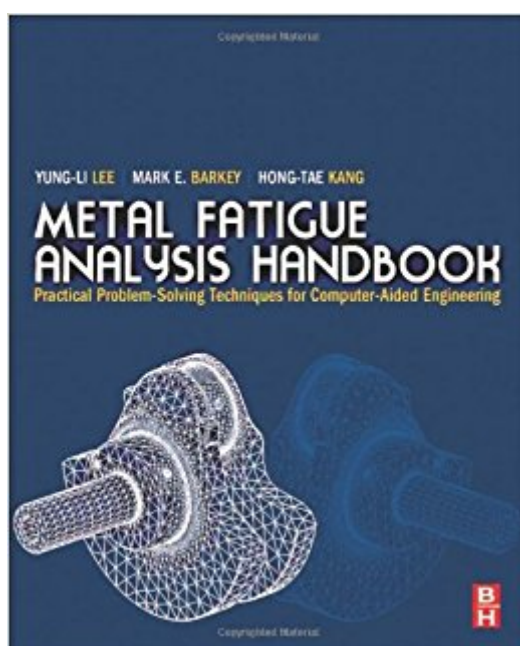


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# Metal Fatigue Analysis Handbook: Practical Problem-solving Techniques For Computer-aided Engineering



## Synopsis

Understand why fatigue happens and how to model, simulate, design and test for it with this practical, industry-focused reference. Written to bridge the technology gap between academia and industry, the Metal Fatigue Analysis Handbook presents state-of-the-art fatigue theories and technologies alongside more commonly used practices, with working examples included to provide an informative, practical, complete toolkit of fatigue analysis. Prepared by an expert team with extensive industrial, research and professorial experience, the book will help you to understand:

- Critical factors that cause and affect fatigue in the materials and structures relating to your workLoad and stress analysis in addition to fatigue damage – the latter being the sole focus of many books on the topic
- How to design with fatigue in mind to meet durability requirements
- How to model, simulate and test with different materials in different fatigue scenarios
- The importance and limitations of different models for cost effective and efficient testing

Whilst the book focuses on theories commonly used in the automotive industry, it is also an ideal resource for engineers and analysts in other disciplines such as aerospace engineering, civil engineering, offshore engineering, and industrial engineering. The only book on the market to address state-of-the-art technologies in load, stress and fatigue damage analyses and their application to engineering design for durability. Intended to bridge the technology gap between academia and industry - written by an expert team with extensive industrial, research and professorial experience in fatigue analysis and testing. An advanced mechanical engineering design handbook focused on the needs of professional engineers within automotive, aerospace and related industrial disciplines.

## Book Information

Hardcover: 632 pages

Publisher: Butterworth-Heinemann; 1 edition (August 31, 2011)

Language: English

ISBN-10: 0123852048

ISBN-13: 978-0123852045

Product Dimensions: 7.7 x 1.7 x 9.3 inches

Shipping Weight: 3.3 pounds (View shipping rates and policies)

Average Customer Review: 4.2 out of 5 stars 4 customer reviews

Best Sellers Rank: #1,329,506 in Books (See Top 100 in Books) #43 in [Books > Engineering & Transportation > Engineering > Materials & Material Science > Fracture Mechanics](#) #329 in [Books > Engineering & Transportation > Engineering > Materials & Material Science >](#)

## Customer Reviews

"The Metal Fatigue Analysis Handbook was written to bridge the technology gap between academia and industry. It presents state-of-the-art fatigue theories and technologies alongside more commonly used practices. Working examples are included to provide an informative, practical, complete tool kit of fatigue analysis. Prepared by an expert team with extensive industrial, research, and professorial experience, the book examines critical factors that cause and affect fatigue in the materials and structures, load and stress analysis, ways to design to meet durability requirements, and how to model, simulate, and test with different materials in different fatigue scenarios."

--Mechanical Engineering Magazine, June 2012

Understand why fatigue happens and how to model, simulate, design and test for it with this practical, industry-focused reference. Written to bridge the technology gap between academia and industry, the Metal Fatigue Analysis Handbook presents state-of-the-art fatigue theories and technologies alongside more commonly used practices, with working examples included to provide an informative, practical, complete toolkit of fatigue analysis. Prepared by an expert team with extensive industrial, research and professorial experience, the book will help you to understand: Critical factors that cause and affect fatigue in the materials and structures relating to your workLoad and stress analysis in addition to fatigue damage – the latter being the sole focus of many books on the topic How to design with fatigue in mind to meet durability requirements How to model, simulate and test with different materials in different fatigue scenarios The importance and limitations of different models for cost effective and efficient testing. Whilst the book focuses on theories commonly used in the automotive industry, it is also an ideal resource for engineers and analysts in other disciplines such as aerospace engineering, civil engineering, offshore engineering, and industrial engineering.

Good piece of work but there are some bits of not very English language so one has to guess what's meant.

good sale

The new book from Lee, Barkey and Kang, Metal Fatigue Analysis Handbook, should be in the

library of everyone involved in fatigue analysis at any level. While it calls itself a handbook, it goes far beyond the scope of most handbooks by including in-depth explanations of nearly all of the analysis techniques that are likely to be employed by engineers and scientists who work on durability and fatigue issues in any ground-based transportation and machinery industries. The book is replete with example problems that are explained in much greater detail than is typically seen in books on this topic. It is also richly illustrated and thoroughly referenced. The book covers all of the issues and topics that most ground vehicle engineers will address, from the basics of stress-based uniaxial fatigue analysis, to advanced multi-axial strain-based analysis, and the very specialized and often overlooked topics of vibration fatigue, weld fatigue life-prediction and the finite element analysis (FEA) of bolted joints. There are 12 chapters in all. Chapter 1, Road Load Analysis Techniques in Automotive Engineering, covers the types of loads and load histories that automobiles are subjected to, and how those loads are captured and converted into component stresses and strains that can be further analyzed. It describes the standard testing and analysis procedures that are employed, the instruments that record data, and the commercial FEA models that are used to analyze the data. Chapter 2, Pseudo Stress Analysis Techniques, delves into the fundamentals of the linear-elastic FEA methods that are the most commonly used techniques for static stress and modal transient stress response analyses. Chapter 3, Rainflow Cycle Counting Techniques, is a very thorough and complete descriptions of rainflow cycle counting techniques. Chapters 4 and 5 cover stress-based fatigue analysis, first for uniaxial stresses, then the more complex multi-axial stress environments. Strain-based uniaxial fatigue analysis is covered in chapter 6, followed by cyclic plasticity theories in chapter 7, and multi-axial strain-based fatigue analysis in chapter 8. Chapters 9-12 cover topics that are not normally covered in detail in general fatigue books, but are discussed in great detail in this work. Vibration Fatigue Testing and Analysis is the name of chapter 9. In this chapter, a standard fatigue damage spectrum procedure was discussed, and methods for calculating fatigue damage were explained for both sinusoidal and random fatigue tests. Chapter 10 contained a treatment of a variety of techniques for conducting life-prediction analyses for seam-welded joints. These methods generally used elementary structural mechanics, which were obtained from linear elastic FEA. The life prediction methods of Dong, and also of Sonsino are discussed in depth. Life prediction methods are the topic of chapter 11. In this chapter, the load-life, linear elastic fracture mechanics (LEFM), and the stress life approach are explained as the primary methods of spot weld life prediction. The final chapter discusses the design and analysis of bolted joints. In chapter 12, the basics of VDI 2230 are explained. VDI 2230 is the European standard for the design and analysis of bolted joints. In this chapter, two different FE models are

described: The solid bolt model and the spider bolt method. The spider bolt method is used for bolts with threads that are rolled after heat treatment, while the solid bolt method is used for situation where residual stresses are not present, as in bolts with threads rolled before heat treatment. This book is an excellent reference for both students at the graduate school level, and also for practicing engineers. It covers in detail both the fundamentals theories, and the applications of modern computer aided engineering software in the field of durability and fatigue analysis. It also contains well documented examples, which are invaluable tools for applying the concepts that are laid out in this book.

Metal Fatigue Analysis Handbook provides the engineer with a ready reference for fatigue analysis techniques ranging from daily run-of-the-mill stress and strain uniaxial fatigue analysis approaches to more elaborate multiaxial fatigue analyses. Many different approaches to fatigue analysis are presented including vibration fatigue testing and analysis, fatigue life prediction of welds and various other fatigue analysis techniques used in the automotive industry (but are applicable to a broad range of fields). Of particular interest and usefulness (in my opinion) were the chapters Rainflow Cycle Counting Techniques (Chapter 3) and the Design and Analysis of Metric Bolted Joints (Chapter 12). The rainflow cycle counting chapter includes multiaxial rainflow counting techniques which are rarely seen in textbooks and is written in a manner accessible to the average engineer. The bolted joint chapter is an excellent distillation of the subject matter to its most useful aspects and the inclusion of discussions about VDI 2230 in this chapter are valuable.

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