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# Book Reviews

**Mechanical Engineering Design (4th Ed.).** by J. E. Shigley & L. D. Mitchell, McGraw-Hill, New York, 1983, 869 pages. Price: $35.95

**Reviewed by H. Saunders**

This book has been a "household word" for years. Many of us were weaned on this book, either as a text or prime reference book.

This new edition is 100 pages longer than the previous edition, and it still retains its original charm and ease of reading. Its prime new attraction is the updating of the old desk calculator with the modern minicomputer and programmable calculator, together with an abundant display and discussion of flow charts and computer programs. The authors also include a number of examples explaining the various theories involved in mechanical design, believing that, "Mechanical design is the very core of other professional and other design studies in mechanical (*aeronautical, shipbuilding, nuclear*)* engineering." As might be expected, some chapters are more thoroughly revised than others.

The necessary update of codes and standards is found in chapter 1, while the second chapter, on stress analysis, has a new contribution on the singularity functions applied to beam analysis. The authors introduce the programmable calculator in the determinations of deflections and stiffness of a beam and column in the third chapter. The next chapter revises the discussion of materials. The mechanical processes have been tightened and made more comprehensible to the reader.

Chapter 5 covers statistics. It has been condensed from the previous edition. Chapter 6 has been expanded from the previous edition and labeled "Design for Static Strength." New contributions are finite elements used in stress concentration analysis and fracture mechanics.

Chapter 7, chapter 6 of the old edition, reports on fatigue strength. It covers *S/N* diagram, high-cycle fatigue, stress concentration effects plus a number of other allied topics. The main new contribution is a discussion of low-cycle fatigue using Manson–Coffin equations. The authors allude to but do not mention Morrow–Landgraf equations in low- and high-cycle fatigue. Included is the addition of Kimmelman factor of safety.

Chapter 8 offers a more comprehensive study of gasketed joints with a revised section on tension and loaded bolted joints, and a new method on fatigue loading and bolt preload. The new contributions in chapter 9 are the use and results of finite elements in the study of fillet welds, and the section on brazed and bonded joints. Computer routines are added to chapter 10's discussion of the underlying principles of design of mechanical springs, and, there is an expanded section on torsion springs. The succeeding treatment of roller contact bearings is unchanged from previous editions.

Subsequent chapters speak about lubrication and journal bearings, spur gears, and the design of helical, bevel, and worm gears. New additions include charts for multiviscosity lubricants, improvement of journal-bearing examples, and revised tables on Lewis form factors and its variants used in gear design.

The Kimmelman load line and Sines approaches used in fatigue analysis brakes, clutches, couplings and flywheel are added to chapter 15. Brakes and couplings have been simplified. New sections include energy dissipation, temperature rise and a vivid discussion of flywheel design. Advantage is taken of numerical integration routines in minicomputer and programmable calculators. Discussion of flexible mechanical elements is unchanged from previous editions.

A weakness is the deletion of sections on system approach. These covered the setup of the mathematical model, system and dynamic response, plus modeling hints of masses and inertias. Additional topics excluded from the new edition are shock model analysis, impact stresses and deflection of cam systems. In addition, the computer programs should have been included in either BASIC or FORTRAN, or other computer routines, and should have been slanted toward applications in mechanical design. The Heywood method for determinations of stresses in gear teeth should be included, also. Nonetheless, these seem small flaws in a work that continues to be a standard in the field.

*Italics added by the reviewer.

This textbook is designed to serve as a text for undergraduate students of mechanical engineering. It covers fundamental principles, design methodologies and applications of machine elements. It helps students to learn to analyse and design basic machine elements in mechanical systems. Beginning with the basic concepts, the book discusses wide range of topics in design of mechanical elements. The emphasis is on the underlying concepts of design procedures. Associate Professor of Mechanical Engineering, Missouri University of Science and Technology. Shigleyâ€™s mechanical engineering design, tenth edition. Published by McGraw-Hill Education, 2 Penn Plaza, New York, NY 10121. Copyright Â© 2015 by McGraw-Hill Education. Mechanical engineering is an engineering branch that combines engineering physics and mathematics principles with materials science to design, analyze, manufacture, and maintain mechanical systems. It is one of the oldest and broadest of the engineering branches. The mechanical engineering field requires an understanding of core areas including mechanics, dynamics, thermodynamics, materials science, structural analysis, and electricity. In addition to these core principles, mechanical engineers use Shigleyâ€™s Mechanical Engineering Design. Richard G. Budynas, J. Keith Nisbett. Preference : This text is intended for students beginning the study of mechanical engineering design. The focus is on blending fundamental development of concepts with practical specification of components. Students of this text should find that it inherently directs them into familiarity with both the basis for decisions and the standards of industrial components.