

Objectives

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. For this reason, as students transition to practicing engineers, they will find that this text is indispensable as a reference text. The objectives of the text are to:

- Cover the basics of machine design, including the design process, engineering mechanics and materials, failure prevention under static and variable loading, and characteristics of the principal types of mechanical elements.
- Offer a practical approach to the subject through a wide range of real-world applications and examples.
- Encourage readers to link design and analysis.
- Encourage readers to link fundamental concepts with practical component specification.

New to This Edition

Enhancements and modifications to the tenth edition are described in the following summaries:

- A new Chap. 20, *Geometric Dimensioning and Tolerancing*, has been added to introduce an important topic in machine design. Most of the major manufacturing companies utilize geometric dimensioning and tolerancing (GD&T) as a standardized means of accurately representing machine parts and assemblies for the purposes of design, manufacture, and quality control. Unfortunately, many mechanical engineers do not have sufficient exposure to the notation and concepts of GD&T to interpret the drawings.

During the time when GD&T was becoming most prevalent in manufacturing, many engineering schools were phasing out comprehensive drafting courses in favor of computerized CAD instruction. This was followed by another transition to 3D solid modeling, where the part was drawn with ideal dimensions. Unfortunately, this ability to draw a perfect part in three dimensions is all too often accompanied by a neglect of focus on how to accurately and uniquely represent the part for manufacture and inspection.

A full understanding of GD&T is usually obtained through an intensive course or training program. Some mechanical engineers will benefit from such a rigorous training. *All* mechanical engineers, however, should be familiar with the basic concepts and notation. The purpose of the coverage of GD&T in this new chapter is to provide this foundational exposure that is essential for all machine designers.

It is always a challenge to find time to include additional material in a course. To facilitate this, the chapter is arranged and presented at a level appropriate for students

to learn in an independent study format. The problems at the end of the chapter are more like quiz questions, and are focused on checking comprehension of the most fundamental concepts. Instructors are encouraged to consider using this chapter as a reading assignment, coupled with even a minimal lecture or online discussion. Of course, there is ample material for expanded presentation and discussion as well.

- Chapter 1, *Introduction to Mechanical Engineering Design*, has been expanded to provide more insight into design practices. Further discussion of the development of the *design factor* is presented, as well as the statistical relationships between *reliability* and the *probability of failure*, and reliability and the design factor. Statistical considerations are provided here rather than in a chapter at the end of the text as in past editions. The section on Dimensions and Tolerances has been expanded to emphasize the designer's role in specifying dimensions and tolerances as a critical part of machine design.
- The chapter of the previous edition, *Statistical Considerations*, has been eliminated. However, the material of that chapter pertinent to this edition has been integrated within the sections that utilize statistics. The stand-alone section on stochastic methods in Chap. 6, *Fatigue Failure Resulting from Variable Loading*, has also been eliminated. This is based on user input and the authors' convictions that the excessive amount of development and data provided in that section was far too involved for the simple class of problems that could be solved. For instructors who still want access to this material, it is available on McGraw-Hill's Online Learning Center at www.mhhe.com/shigley.
- In Chap. 11, *Rolling-Contact Bearings*, the Weibull probability distribution is defined and related to bearing life.
- In conjunction with the Connect Engineering resource, the end-of-chapter problems have been freshly examined to ensure they are clearly stated with less room for vague interpretations. Approximately 50 percent of the problems are targeted for Connect implementation. With the problem parameterization available in this Web-based platform, students can be assigned basic problems with minimal duplication from student to student and semester to semester. For a good balance, this edition maintains many end-of-chapter problems that are open-ended and suitable for exploration and design.



Connect Engineering

The tenth edition continues to feature McGraw-Hill Connect Engineering, a Web-based assignment and assessment platform that allows instructors to deliver assignments, quizzes, and tests easily online. Students can practice important skills at their own pace and on their own schedule.



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Additional media offerings available at www.mhhe.com/shigley include:

Student Supplements

- *Fundamentals of Engineering (FE) exam questions for machine design.* Interactive problems and solutions serve as effective, self-testing problems as well as excellent preparation for the FE exam.

Instructor Supplements (under password protection)

- *Solutions manual.* The instructor's manual contains solutions to most end-of-chapter nondesign problems.
- *PowerPoint® slides.* Slides outlining the content of the text are provided in PowerPoint format for instructors to use as a starting point for developing lecture presentation materials. The slides include all figures, tables, and equations from the text.
- *C.O.S.M.O.S.* A complete online solutions manual organization system that allows instructors to create custom homework, quizzes, and tests using end-of-chapter problems from the text.

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