Preface

This textbook is intended for use in a first course in mechanics of materials. Programs of instruction relating to the mechanical sciences, such as mechanical, civil, and aerospace engineering, often require that students take this course in the second or third year of studies. Because of the fundamental nature of the subject matter, mechanics of materials is often a required course, or an acceptable technical elective in many other curricula. Students must have completed courses in statics of rigid bodies and mathematics through integral calculus as prerequisites to the study of mechanics of materials.

This edition maintains the organization of the previous edition. The first eight chapters are dedicated exclusively to elastic analysis, including stress, strain, torsion, bending and combined loading. An instructor can easily teach these topics within the time constraints of a two-or three-credit course. The remaining five chapters of the text cover materials that can be omitted from an introductory course. Because these more advanced topics are not interwoven in the early chapters on the basic theory, the core material can efficiently be taught without skipping over topics within chapters. Once the instructor has covered the material on elastic analysis, he or she can freely choose topics from the more advanced later chapters, as time permits. Organizing the material in this manner has created a significant savings in the number of pages without sacrificing topics that are usually found in an introductory text.

The most notable features of the organization of this text include the following:

- Chapter 1 introduces the concept of stress (including stresses acting on inclined planes). However, the general stress transformation equations and Mohr's circle are deferred until Chapter 8. Engineering instructors often hold off teaching the concept of state of stress at a point due to combined loading until students have gained sufficient experience analyzing axial, torsional, and bending loads. However, if instructors wish to teach the general transformation equations and Mohr's circle at the beginning of the course, they may go to the freestanding discussion in Chapter 8 and use it whenever they see fit.
- Advanced beam topics, such as composite and curved beams, unsymmetrical bending, and shear center, appear in chapters that are distinct from the basic beam theory. This makes it convenient for instructors to choose only those topics that they wish to present in their course.
- Chapter 12, entitled "Special Topics," consolidates topics that are important but not essential to an introductory course, including energy methods, theories of failure, stress concentrations, and fatigue. Some, but not all, of this material is commonly covered in a three-credit course at the discretion of the instructor.

- Chapter 13, the final chapter of the text, discusses the fundamentals of inelastic analysis. Positioning this topic at the end of the book enables the instructor to present an efficient and coordinated treatment of elastoplastic deformation, residual stress, and limit analysis after students have learned the basics of elastic analysis.
- Following reviewers' suggestions, we have included a discussion of the torsion of rectangular bars. In addition, we have updated our discussions of the design of columns and reinforced concrete beams.

The text contains an equal number of problems using SI and U.S. Customary units. Homework problems strive to present a balance between directly relevant engineering-type problems and "teaching" problems that illustrate the principles in a straightforward manner. An outline of the applicable problem-solving procedure is included in the text to help students make the sometimes difficult transition from theory to problem analysis. Throughout the text and the sample problems, free-body diagrams are used to identify the unknown quantities and to recognize the number of independent equations. The three basic concepts of mechanics—equilibrium, compatibility, and constitutive equations—are continually reinforced in statically indeterminate problems. The problems are arranged in the following manner:

- Virtually every section in the text is followed by sample problems and homework problems that illustrate the principles and the problem-solving procedure introduced in the article.
- Every chapter contains review problems, with the exception of optional topics. In this way, the review problems test the students' comprehension of the material presented in the entire chapter, since it is not always obvious which of the principles presented in the chapter apply to the problem at hand.
- Most chapters conclude with computer problems, the majority of which are design oriented. Students should solve these problems using a high-level language, such as MATHCAD® or MATLAB®, which minimizes the programming effort and permits them to concentrate on the organization and presentation of the solution.

Ancillaries To access additional course materials, please visit www.cengagebrain.com. At the cengagebrain.com home page, search for the ISBN of your title (from the back cover of your book) using the search box at the top of the page, where these resources can be found, for instructors and students. The following ancillaries are available at www.cengagebrain.com.

- *Study Guide to Accompany Pytel and Kiusalaas Mechanics of Materials, Second Edition*, J. L Pytel and A. Pytel, 2012. The goals of the *Study Guide* are twofold. First, self-tests are included to help the student focus on the salient features of the assigned reading. Second, the study guide uses "guided" problems which give the student an opportunity to work through representative problems before attempting to solve the problems in the text. The *Study Guide* is provided free of charge.
- The *Instructor's Solution Manual* and PowerPoint slides of all figures and tables in the text are available to instructors through http://login.cengage.com.

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