Engineering Mechanics: Statics & Dynamics, 10th Edition

By Russell C. Hibbeler

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Offers a concise and thorough presentation of engineering mechanics theory and application. The material is reinforced with numerous examples to illustrate principles and imaginative, well-illustrated problems of varying degrees of difficulty. The book is committed to developing users' problem-solving skills. Features new "Photorealistc" figures (approximately 400) that have been rendered in often 3D photo quality detail to appeal to visual learners. Presents a thorough combination of both static and dynamic engineering mechanics theory and applications. Features a large variety of problem types from a broad range of engineering disciplines, stressing practical, realistic situations encountered in professional practice, varying levels of difficulty, and problems that involve solution by computer. For professionals in mechanical engineering, civil engineering, aeronautical engineering, and engineering mechanics careers.

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Editorial Review

The main purpose of this book is to provide the student with a clear and thorough presentation of the theory and applications of engineering mechanics. To achieve this objective, the author has by no means worked alone; to a large extent, this book, through its 10 editions, has been shaped by the comments and suggestions of hundreds of reviewers in the teaching profession as well as many of the author's students.

New Features

Some unique features used throughout this tenth edition include the following:

- **Illustrations.** Throughout the book, new photorealistic illustrations have been added that provide a strong connection to the 3-D nature of engineering. In addition, particular attention has been placed on providing a view of any physical object, its dimensions, and the vectors applied to it in a manner that can be easily understood.
- **Problems.** The problems sets have been revised so that instructors can select both design and analysis problems having a wide range of difficulty. Apart from the author, two other professionals have checked all the problems for clarity and accuracy of the solutions. At the end of some chapters, design projects are included.
- **Review Material.** New end-of-chapter review sections have been added to help students recall and study key chapter points.

Of course, the hallmarks of the book remain the same: Where necessary, a strong emphasis is placed on drawing a free-body diagram, and the importance of selecting an appropriate coordinate system, and associated sign convention for vector components is stressed when the equations of mechanics are applied.

Contents

Statics

The subject of Statics is covered in the first 11 chapters, in which the principles are applied first to simple, then to more complicated situations. Most often, each principle is applied first to a particle, then to a rigid body subjected to a coplanar system of forces, and finally to a general case of three-dimensional force systems acting on a rigid body.

Chapter 1 begins with an introduction to mechanics and a discussion of units. The notation of a vector and the properties of a concurrent force system are introduced in Chapter 2. This theory is then applied to the equilibrium of a particle in Chapter 3. Chapter 4 contains a general discussion of both concentrated and distributed force systems and the methods used to simplify them. The principles of rigid-body equilibrium are developed in Chapter 5 and then applied to specific problems involving the equilibrium of trusses, frames, and machines in Chapter 6, and to the analysis of internal forces in beams and cables in Chapter 7. Applications to problems involving frictional forces are discussed in Chapter 8, and topics related to the center of gravity and centroid are treated in Chapter 9. If time permits, sections concerning more advanced topics, indicated by stars (*) may be covered. Most of these topics are included in Chapter 10 (area and mass

moments of inertia) and Chapter 11 (virtual work and potential energy). Note that this material also provides a suitable reference for basic principles when it is discussed in more advanced courses.

Alternative Coverage. At the discretion of the instructor, some of the Material may be presented in a different sequence with no loss of continuity. For example, it is possible to introduce the concept of a force and all the necessary methods of vector analysis by first covering Chapter 2 and Section 4.2. Then after covering the rest of Chapter 4 (force and moment systems), the equilibrium methods of Chapters 3 and 5 can be discussed.

Dynamics

The subject of Dynamics is presented in the last 11 chapters, the kinematics of a particle is discussed in Chapter 12, followed by a discussion of particle kinetics in Chapter 13 (equation of motion), Chapter 14 (work and energy), and Chapter 15 (impulse and momentum). The concepts of particle dynamics contained in these four chapters are then summarized in a "review" section, and the student is given the chance to identify and solve a variety of problems. A similar sequence of presentation is given for the planar motion of a rigid body: Chapter 16 (planar kinematics), Chapter 17 (equations of motion), Chapter 18 (work and energy), and Chapter 19 (impulse and momentum), followed by a summary and review set of problems for these chapters.

If time permits, some of the material involving three-dimensional regid-body motion may be included in the course. The kinematics and kinetics of this motion are discussed in Chapters 20 and 21, respectively. Chapter 22 (vibrations) may be included if the student has the necessary mathematical background. Sections of the book which are considered to be beyond the scope of the basic dynamics course are indicated by a star (*) and may be omitted. Note that this material also provides a suitable reference for basic principles when it is discussed in more advanced courses.

Alternative Coverage. At the discretion of the instructor, it is possible to cover Chapter 12 through 19 in the following order with no loss in continuity: Chapters 12 and 16 (kinematics), Chapters 13 and 17 (equations of motion), Chapters 14 and 18 (work and energy), and Chapters 15 and 19 (impulse and momentum).

Special Features

Organization and Approach. The contents of each chapter are organized into well-defined sections that contain an explanation of specific topics, illustrative example problems, and a set of homework problems. The topics within each section are placed into subgroups defined by boldface titles. The purpose of this is to present a structured method for introducing each new definition or concept and to make the book convenient for later reference and review.

Chapter Contents. Each chapter begins with an illustration demonstrating a broad-range application of the material within the chapter. A bulleted list of the chapter contents is provided to give a general overview of the material that will be covered.

Free-Body Diagrams. The first step to solving most mechanics problems requires drawing a diagram. By doing so, the student forms the habit of tabulating the necessary data while focusing on the physical aspects of the problem and its associated geometry. If this step is performed correctly, applying the relevant equations of mechanics becomes somewhat methodical since the data can be taken directly from the diagram. This step is particularly important when solving equilibrium problems, and for this reason drawing free-body diagrams is strongly emphasized throughout the book. In particular, special sections and examples are devoted to show how to draw free-body diagrams, and specific homework problems in many sections of

the book have been added to develop this practice.

Procedures for Analysis. Found after many of the sections of the book, this unique feature provides the student with a logical and orderly method to follow when applying the theory. The example problems are solved using this outlined method in order to clarify its numerical application. It is to be understood, however, that once the relevant principles have been mastered and enough confidence and judgment have been ed, the student can then develop his or her own procedures for solving problems.

Photographs. Many photographs are used throughout the book to explain how the principles of mechanics apply to real-world situations. In some sections, photographs have been used to show how engineers must first make an idealized model for analysis and then proceed to draw a free-body diagram of this model in order to apply the theory.

Important Points. This feature provides a review or summary of the most important concepts in a section and highlights the most significant points that should be realized when applying the theory to solve problems.

Conceptual Understanding. Through the use of photographs placed throughout the book, theory is applied in a simplified way in order to illustrate some of its more important conceptual features and instill the physical meaning of many of the terms used in the equations. These simplified applications increase interest in the subject matter and better prepare the student to understand the examples and solve problems.

Example Problems. All the example problems are presented in a concise manner and in a style that is easy to understand.

Homework Problems

- **Free-Body Diagram Problems.** Many sections of the book contain introductory problems that only require drawing the free-body diagram for the specific problems within a problem set. These assignments will impress upon the student the importance of mastering this skill as a requirement for a complete solution of any equilibrium problem.
- **General Analysis and Design Problems.** The majority of problems in the book depict realistic situations encountered in engineering practice. Some of these problems come from actual products used in industry and are stated as such. It is hoped that this realism will both stimulate the student's interest in engineering mechanics and provide a means for developing the skill to reduce any such problem from its physical description to a model or symbolic representation to which the principles of mechanics may be applied. Throughout the book, there is an approximate balance of problems using either SI or FPS units Furthermore, in any set, an attempt has been made to arrange the problems in order of increasing difficulty. (Review problems at the end of each chapter are presented in random order.) The answers to all but every fourth problem are listed in the back of the book. To alert the user to a problem without a reported answer, an asterisk (*) is placed before the problem number.
- **Computer Problems.** An effort has been made to include some problems that may be solved using a numerical procedure executed on either a desktop computer or a programmable pocket calculator. Suitable numerical techniques along with associated computer programs are given in Appendix B. The intent here is to broaden the student's capacity for using other forms of mathematical analysis without sacrificing the time needed to focus on the application of the principles of mechanics. Problems of this type, which either can or must be solved using numerical procedures, are identified by a "square" symbol preceding the problem number.
- **Design Projects.** At the end of some of the chapters, design projects have been included. It is felt that this type of assignment should be given only after the student has developed a basic understanding of the

subject matter. These projects focus on solving a problem by specifying the geometry of a structure or mechanical object needed for a specific purpose. A force analysis is required and, in many cases, safety and cost issues must be addressed

- **Chapter Reviews.** New chapter review sections summarize key point of the chapter, often in bulleted lists.
- **Appendices.** The appendices provide a source of mathematical formula and numerical analysis needed to solve the problems in the book. Appendix C provides a set of problems typically found on the Fundamentals of Engineering Examination. By providing a partial solution to all the problems, the student is given a chance to further practice his or her skills.

Users Review

From reader reviews:

Gerri Townsend:

Reading a book tends to be new life style within this era globalization. With studying you can get a lot of information which will give you benefit in your life. Together with book everyone in this world can easily share their idea. Books can also inspire a lot of people. Plenty of author can inspire their reader with their story or perhaps their experience. Not only the storyplot that share in the textbooks. But also they write about the knowledge about something that you need illustration. How to get the good score toefl, or how to teach your kids, there are many kinds of book which exist now. The authors in this world always try to improve their proficiency in writing, they also doing some exploration before they write for their book. One of them is this Engineering Mechanics: Statics & Dynamics, 10th Edition.

Latosha Page:

Engineering Mechanics: Statics & Dynamics, 10th Edition can be one of your starter books that are good idea. We all recommend that straight away because this book has good vocabulary that can increase your knowledge in language, easy to understand, bit entertaining but nevertheless delivering the information. The writer giving his/her effort to get every word into enjoyment arrangement in writing Engineering Mechanics: Statics & Dynamics, 10th Edition yet doesn't forget the main stage, giving the reader the hottest in addition to based confirm resource info that maybe you can be certainly one of it. This great information can drawn you into new stage of crucial thinking.

Linda Bryant:

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Linda Barefoot:

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