Preface

To the Student

As you begin the study of engineering no doubt you are filled with enthusiasm, curiosity, and a desire to succeed. Your first year will be spent primarily in establishing a solid foundation in mathematics, basic sciences, and communications. Also, you will be introduced to selected engineering topics that will demonstrate how engineers approach problem solving, arrive at correct solutions, and interface with other engineering professionals and the general public to implement the solutions. You will see how mathematics, science, and communications provide the means to solve problems and convey the solutions in a manner that can be clearly understood and quickly verified by the appropriate persons. You will quickly discover the need for more in-depth study in many engineering subjects in order to solve increasingly complex problems. As authors, we believe the material presented in this book will provide you with a fundamental understanding of how engineers function in today's technological world. After your study of topics in this text, we believe you will be eager to enter the advanced engineering subjects in your chosen discipline, confident that you will successfully achieve your educational goals.

To the Instructor

Engineering courses for first-year students cover a wide range of topics from an overview of the engineering profession to discipline-specific subjects. A broad set of course goals, including coverage of prerequisite material, motivation, and retention, have spawned a variety of first-year activity. Courses in introductory engineering and problem solving routinely utilize spreadsheets and mathematical solvers in addition to teaching the rudiments of a computer language. The Internet has become a major instructional tool, providing a wealth of data to supplement your class notes and textbooks. This sixth edition continues the authors' intent to introduce the profession of engineering and to provide students with many of the tools and techniques needed to succeed.

The sixth edition of this text draws on the experiences the authors have encountered with the first five editions and incorporates many excellent suggestions from faculty and students using the text. Over the past 30 years the fundamentals of problem solving have remained nearly the same, but the numerical tools and presentation techniques have improved tremendously. Therefore our general objectives remain the same for this sixth edition, and we have concentrated on new problems and improvements in the textual material.

The objectives are (1) to motivate engineering students during their first year when exposure to the subject matter of engineering is limited, (2) to provide students with experience in solving problems in both SI and customary units while presenting solutions in a logical manner, (3) to introduce students

to subject areas common to most engineering disciplines that require the application of fundamental engineering concepts, and (4) to develop students' skills in solving open-ended problems.

The material in this book is presented in a manner that allows each of you to emphasize certain aspects more than others without loss of continuity. In the sixth edition, five chapters from the fifth edition have been subdivided to clarify the material coverage and aid you in planning your course. The problems that follow most chapters vary in difficulty so that students can experience success rather quickly and still be challenged as problems become more complex. A large number of the problems are new or revised.

There is sufficient material in the seventeen chapters for a three-credit semester course. By omitting some chapters and/or by varying coverage from term to term, you can present a sound introductory problem-solving course in two to four quarter credits or two semester credits.

The book may be visualized as having three major sections. The first, encompassing the first three chapters, is an introduction to the engineering profession. Chapter 1 provides information on engineering disciplines and functions. If a formal orientation course is given separately, Chapter 1 can be simply a reading assignment and the basis for students to investigate disciplines of interest. Chapter 2 outlines the course of study and preparation for an engineering work environment. Interdisciplinary projects, teaming, and ethics are discussed. Chapter 3 is an introduction to the design process. If time permits, this material can be supplemented with case studies and your personal experiences to provide an interesting and motivating look at engineering.

The second major section, Processing Engineering Data, includes materials we believe that all engineering students require in preparation for success in the engineering profession. Chapters 4 and 5 provide procedures for approaching an engineering problem, determining the necessary data and method of solution, and presenting the results. The authors have found that emphasis in this area will reap benefits when the material and problems become more difficult later.

Chapters 6 and 7 include engineering estimations and dimensions and units (including both customary and SI units). Throughout the book discussions and example problems tend to emphasize SI metric. However, other dimension systems are used extensively today, so a number of our examples and problems contain nonmetric units to ensure that students are exposed to conversions and other units that are commonly used.

Chapters 8 and 9, Engineering Economy, demonstrate the importance of understanding the time value of money in making engineering decisions. Chapter 8 emphasizes basic calculations using everyday information such as credit card debt, savings accounts, and current interest rates. Chapter 9 follows with applications to engineering decision making for equipment selection, depreciation, and taxes. Chapters 10 and 11, Statistics, provide an introduction to a subject that is assuming a greater role in engineering decision making. Chapter 10 introduces basic descriptive statistics, linear regression and coefficient of correlation. Chapter 11 includes normal distributions but adds several new distributions including *Student's t, F* and *Chi-Square*. It also adds new material on the use of inferential statistics and a general introduction to randomized

sampling and experimental design. The ability to take large amounts of test or field data, perform statistical analyses, and draw correct conclusions is crucial in establishing performance parameters. Engineering Economy and Statistics are subdivided, permitting you to choose the first chapter for an introduction to the fundamentals and, if time permits, applications to specific engineering activities can be covered.

The third major section provides engineering content that you can use to reinforce fundamentals from the previous section. Chapters 12 through 17 allow you as an instructor a great deal of flexibility. Chapters 12 and 13 on engineering mechanics provide an introduction to statics and strength of materials. Force vectors, two-dimensional force systems, and the conditions of equilibrium are emphasized in Chapter 12. Chapter 13 emphasizes stresses and strains and requires Chapter 12 as a prerequisite. Chapters 15 and 16, covering energy topics, have undergone significant updating. Chapter 15 discusses energy forms and sources. The authors believe that engineering students need to become aware of the world's current dependence on fossil fuels very early in their studies so they may apply this knowledge to the use and development of alternative sources of energy.

Chapter 16 follows with an introduction to thermodynamics and applications of the First and Second Laws of Thermodynamics. The study of Chapter 16 should be preceded by coverage of Chapter 15.

Chapters 14, Material Balance, and Chapter 17, Electrical Theory, complete the third major section and contain upgraded example problems.

Certain problems suggest the use of a computer or spreadsheet for solution. These are open-ended or "what-if" problems. Depending on the students' prior work with programming or spreadsheets, additional instruction may be required before attempting these problems.

The appendixes are provided as a ready reference on selected areas that will enable students to review topics from algebra and trigonometry. The National Society of Professional Engineers' Code of Ethics for Engineers is included and is highly recommended for reading and class discussion. A brief section on flow-charting for computer programming is included. Other appendixes include tables, unit conversions, formulas, and selected answers to chapter problems.

Because the text was written for first-year engineering students, mathematical expertise beyond algebra, trigonometry, and analytical geometry is not required for any material in the book. The authors have found, however, that additional experience in pre-calculus mathematics is very helpful as a prerequisite for this text.

Online Resources

The sixth edition features an accompanying website at www.mhhe.com/ eide6e. The site features numerous instructor resources, including solutions to the problems, an image library, and new lecture PowerPoints for each chapter. New to this edition is also a test bank for each chapter that allows instructors to assign online homework and quizzes. This online homework is gradable and can be edited by instructors.

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