

TO THE PROFESSOR

Concepts in Engineering Second Edition introduces fundamental engineering concepts to freshman engineering students. It can be the primary text for a 1- or 2-credit introductory course that focuses on engineering fundamentals common to all engineering disciplines. Alternatively, it can be a supporting text in a 2- or 3-credit course that teaches introductory engineering concepts and other relevant topics, such as engineering computation or graphics. The specific goals of the text follow:

- *Excite students about engineering.* We hope to stimulate students' interest in engineering by describing engineering history, challenging them with “brain teaser” problems, and explaining the creative process.
- *Build problem-solving skills.* The most important engineering skill is the ability to solve problems. We describe many heuristic approaches to creative problem solving as well as a systematic approach to solving well-defined engineering problems.
- *Cultivate professionalism.* Students are introduced to various engineering disciplines as well as other members of the technology team. They learn about the traits of successful and creative engineers. Information is provided about the advantages of obtaining advanced degrees and becoming a professional engineer. Also, students are introduced to the important topic of engineering ethics.
- *Introduce the design process.* To help freshmen experience the joy of engineering, we think it is necessary for them to work on a design project. To help support this activity, we introduce the design process.
- *Emphasize the importance of communication skills.* Too often, engineers are criticized for lacking communication skills. To help overcome this problem, we provide information on both oral and written communication that will be immediately useful to freshmen during their design project.

Because it uses only high school mathematics, *Concepts in Engineering Second Edition* can be used by students who are not calculus-ready. For students who need to review their high school mathematics, a mathematics supplement is available in printed form or at the following Web site: <http://www.mhhe.com/holtzapple>. It briefly describes algebra, mathematical notation, probability, geometry, trigonometry, logarithms, polynomials, zeros of equations, and calculus. Each chapter in *Concepts in Engineering Second Edition* that has mathematical content informs students of the prerequisites needed to fully understand the chapter, and directs them to the appropriate chapters in the mathematics supplement.

Concepts in Engineering Second Edition has a sister text called *Foundations of Engineering*, which provides an introduction to the following engineering science topics: computers, statistics, Newton's laws, thermodynamics, rate processes (i.e., heat transfer, fluid flow, electricity, and diffusion), statics and dynamics, and electronics. It also introduces "engineering accounting," a conceptual framework that supports engineers in all disciplines as they count the following: mass, charge, linear momentum, angular momentum, energy, entropy, and money. If you wish to include some of these topics in your course, selected chapters are available from McGraw-Hill Custom Publishing.

McGraw-Hill maintains a Web site at www.mhhe.com/holtzapple that provides supplemental teaching materials. Please visit the site; we're sure you will find it useful.

We would like to thank our reviewers for their valuable input on this edition, especially in shaping chapter 1: Lex Akers, University of Missouri; Angela R. Bielefeldt, University of Colorado; Daniel A. Gulino, Ohio University; Craig James Gunn, Michigan State University; Paul Tartaglia, Norwich University; and several others who wished to remain anonymous.

We hope that you and your students enjoy using this book. We will happily receive suggestions for improvements that may be incorporated into future editions.

Mark T. Holtzapple

W. Dan Reece

TO THE STUDENT

In a track and field race, those who are well prepared place well, and those who are poorly prepared place poorly. The purpose of *Concepts in Engineering Second Edition* is to ensure that you are well prepared, so that you will place well in the “race” you are about to begin. *Concepts in Engineering* introduces you to fundamental engineering concepts that are relevant to all engineering disciplines. The specific goals of our text follow:

- *Excite you about engineering.* Both of us are very happy that we studied engineering and enjoy using it to solve real-world problems. We hope to stimulate your interest in engineering by describing engineering history and challenging you with “brain teaser” problems. Also, we want to help develop your creativity, which is a vital part of engineering.
- *Build your problem-solving skills.* Engineers are hired to solve problems. To help you become a skilled problem solver, we describe several approaches to creative problem solving as well as a systematic approach to solving well-defined engineering problems.
- *Cultivate professionalism.* To help you choose your engineering major, we describe various engineering disciplines and how they relate to other members of the technology team, such as scientists and technicians. We also introduce you to engineering ethics and how engineers impact society.
- *Introduce the design process.* The most creative aspect of engineering is design, where we create technologies that address societal needs. To help you get started, we introduce the design process.
- *Emphasize the importance of communication skills.* Too often, engineers are criticized for lacking communication skills. To overcome this problem, we provide information on both oral and written communication that will be useful throughout your career.

Engineers must master mathematics. If you need to review your high school mathematics, a mathematics supplement is available at the following Web site: <http://www.mhhe.com/holtzapple>. It briefly describes algebra, mathematical notation, probability, geometry, trigonometry, logarithms, polynomials, zeros of equations, and calculus. Each chapter in *Concepts in Engineering Second Edition* that has mathematical content informs you of the prerequisites needed to fully understand the chapter, and directs you to the appropriate chapters in the mathematics supplement.

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