Preface

To meet the needs of talent training in the new era, this textbook combines the classical content of engineering thermodynamics and heat transfer with modern research advances, and expands the scope of knowledge about thermal engineering. We have selected appropriate exercises, which can cultivate students' ability to think independently and solve problems and meet the needs of professional talent training in depth and breadth.

The book consists of 13 chapters, which is categorized into two parts. The first part is composed of eight chapters, that is, Chapters 1–8. Chapter 1, as an introduction, introduces the classification and definition of different energy forms and outlines the research content of this book. Chapter 2 elaborates some basic concepts of engineering thermodynamics, such as thermodynamic system, thermodynamic state, state parameters, and thermodynamic cycle. Chapter 3 introduces the physical essence and mathematical expression for the first law of thermodynamics for open system and closed system and their applications. Chapter 4 presents the properties and the thermal processes of ideal gas. Chapter 5 focuses on the second law of thermodynamics, the Carnot cycle, and the entropy. Chapter 6 elaborates the thermal process and properties of water vapor and wet air. Chapter 7 introduces the power cycle of steam and gas and the piston internal combustion engine cycle. Chapter 8 introduces the refrigeration equipment and the efficiency calculation method. The second part focuses on the heat transfer, which consists of five chapters, that is, Chapters 9–13. Chapter 9 introduces the basic ways of heat transfer and important definitions. Chapter 10 elaborates on the theoretical basis of heat conduction and the relevant knowledge of steady-state heat conduction. Chapter 11 introduces the basic theory of thermal convection, that is, Newton's cooling law, and the influencing factors on heat transfer. Chapter 12 introduces the basic concept of thermal radiation, the basic law of blackbody radiation, the emission characteristics of actual objects, atmospheric greenhouse effect, and greenhouse effect. Chapter 13 describes the heat transfer process and heat exchangers, as well as the enhanced and weakened heat transfer approaches.

This book is of particular use to thermodynamic engineers, mechanical engineers, electrical engineers, and low carbon practitioners worldwide, as well as to academics and researchers in the fields of thermal management, energy engineering, and material science.

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