



Heat and Mass Transfer: Fundamentals and Applications, 6th edition

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NEW TO THE SIXTH EDITION

One of the primary changes in the sixth edition of this text is the effective use of full color to enhance the learning experience of students and to make it more enjoyable. Another significant change is the inclusion of a new section in Chap. 1 on Engineering Codes and Standards (C&S). A knowledge of heat and mass transfer, along with adherence to the relevant codes and standards, allow engineers to analyze, design, and build components and systems to function within the design conditions. Throughout the text, as appropriate, example problems and end-of-chapter problems related to engineering codes and standards have been presented to introduce this concept to tomorrow's engineers. The third important change has been in Chap. 4 where the graphical representation of the one-dimensional transient conduction solutions (Heisler charts) have been eliminated, and the emphasis has been placed on the solution with more accurate approximate or exact analytical expressions. Other important changes have been the addition of five new sections or subsections: "Aerogel—A Remarkable Superinsulating Material," "Equation Solvers," and "Accuracy, Precision and Significant Digits" to Chap. 1, "General Solutions for Simultaneously Moving Plates and Fluids" to Chap. 7, and "Analogies Between Momentum and Heat Transfer in the Transition Region" to Chap. 8.

We have also incorporated 20 new solved example problems in the text, modified over 450 of the existing end-of-chapter problems, and added over 150 new end-of-chapter problems. A

significant number of the new problems are on the concept of Engineering Codes and Standards (C&S). All the popular features of the previous editions have been retained, while new ones have been added. Updates and changes for clarity and readability have been made throughout the text.

ENGINEERING CODES AND STANDARDS (C&S) PROBLEMS

A recent study done by ASME Vision 2030 Project reveals that almost 50 percent of engineers in their early careers are unfamiliar with engineering codes and standards. As companies and manufacturers are expanding operations globally, there is a greater interest in harmonizing codes and standards across jurisdictions and disciplines. The need for engineers to have the knowledge about codes and standards is growing, and having this knowledge allows engineers to innovate and manufacture competitive products. In the subject of heat and mass transfer, there are several engineering codes and standards that are relevant. These codes and standards have been issued and published by professional associations, such as the ASME and the ASHRAE, and standards organizations, such as ASTM International, ANSI, and the ISO. The Engineering Codes and Standards (C&S) concept is first introduced in Chap. 1. The engineering C&S concept complements the Prevention through Design (PtD) concept that was introduced in the fifth edition of this book to emphasize safety in designs. The example problems and end-of-chapter problems in each chapter not only offer perspectives on interesting real-world applications but also introduce the concepts of engineering C&S to tomorrow's engineers so they may influence a change in the culture toward a greater emphasis on codes and standards. The knowledge of heat and mass transfer, along with adherence to the relevant codes and standards, allow engineers to analyze, design, and build components and systems to function within their design conditions.

CONTENT CHANGES AND REORGANIZATION

With the exception of the changes already mentioned, several updates and changes for clarity and readability have been made in the text. In this edition, we have introduced 20 new example problems and over 600 new and modified end-of-chapter problems. The noteworthy changes are summarized here for those who are familiar with the previous edition.

- In Chap. 1, four new sections or subsections have been added: “Aerogel—A Remarkable Superinsulating Material” by Dr. Ann M. Anderson of Union College, “Engineering Codes and Standards (C&S)” by Dr. Clement C. Tang of the University of North Dakota, “Equation Solver,” and “Accuracy, Precision and Significant Digits.” Also, the Topic of Special Interest on “Thermal Comfort” has been expanded.
- In Chap. 3, the section on “Bioheat Transfer Equation” has been expanded.
- In Chap. 4, the graphical representation of the one-dimensional transient conduction solutions (Heisler charts) have been eliminated, and the emphasis has been placed on the solution with more accurate approximate or exact analytical expressions. Based on the input we have received from instructors, very few students use the graphical representations of the one-dimensional, transient conduction solutions (Heisler charts); most prefer to solve the approximate or exact analytical expressions. In addition, all the example problems using the graphical solution have been updated.
- In Chap. 7, a new subsection on “General Solutions for Simultaneously Moving Plates and Fluids” has been added. In addition, new equations for the flat plate average Nusselt number with unheated starting length for laminar and turbulent flows have been added. We have also updated Table 7-1 with several additional correlations for noncircular geometries.
- In Chap. 8, a new subsection on “Analogies Between Momentum and Heat Transfer in

the Transition Region” has been added. Also, we have updated/expanded internal forced convection heat transfer correlations in laminar, transitional, and turbulent flows.

- In Chap. 10, the coverage of the Topic of Special Interest on “Non-Boiling Two-Phase Flow Heat Transfer” has been expanded.
- In Chap. 11, the coverage of the Topic of Special Interest on “The Human Cardiovascular System as a Countercurrent Heat Exchanger” has been expanded.
- In Chap. 13, the section on view factors was updated. We have also updated and added a few view factor relations.