



Book Reviews

Fundamentals of Machine Component Design, Robert C. Juvinall and Kurt M. Marshek, second edition, 1991, 804 pages.

Reviewed by Ken Youssefi¹

This book has been written primarily to introduce mechanical engineering students to the field of Machine Component Design. However, the book may also be used as a reference for practicing engineers. The book consists of two major parts. Part I (first nine chapters) is a review of strength of material topics, material properties and an introduction to static and fatigue failure theories and fracture mechanics; part II (next 10 chapters) deals with the actual design of machine components using the fundamentals covered in the first part. The machine components covered include: fasteners, springs, bearings, gears, brakes and clutches, shafts and flexible components. The last chapter is devoted to a case study and design considerations.

The book offers good theoretical background with some practical insight into the design of different components. The design procedure for each component is outlined clearly in each chapter followed with an example reflecting the authors' practical experience in that particular field. Also provided are numerous illustrations of actual components. The book has a chapter on surface damage which is not included in other books on the same subject. The chapter on welding does not include welding codes in practice; the chapter on gears should include more description of the AGMA approach and standards for gear design since it is an approach practiced widely by designers.

The second edition is essentially the same as the first edition. The main differences are: the problems have been moved to the end of the respective chapters for better continuity, more problems have been added, and examples have been improved with further illustrations.

Advances in Thermal Modeling of Electronic Components and System—Vol. 2, Avram Bar-Cohen and Allan Kraus, editors, ASME Press, 1990.

Reviewed by V. P. Carey²

Advances in Thermal Modeling of Electronic Components and System—Vol. 2 is the second in a biannual series which documents recent developments in analysis of the thermal control of electronics. The six chapters of this book are each written by different authors. Each of the first five chapters provides a state-of-the-art review of a different specialized area.

Chapter 1 describes recent developments related to air cooling and interconnection heat transmission in minicomputers

and microcomputers. This material is covered from a designer's viewpoint, discussing the practical considerations together with strategies for optimizing the heat transfer characteristics of chip and module configurations typical of mini- and microcomputers. Heat transfer modeling is not covered in depth, but limiting cases of the performance characteristics are explored in a useful manner.

Chapter 2 is a detailed presentation of analytical methods for analyzing fin arrays in heat sinks. The discussion is limited in its extent, but it does a good job of covering methods that are particularly useful for analysis of fin arrays in component heat sinks. This chapter would provide a useful starting point for packaging designers who need to access tools for analyzing finned heat sinks.

The third chapter is a state-of-the-art review of microchannel heat sinks for electronics component cooling applications. This excellent review describes both the manufacturing methods and the heat transfer considerations associated with the use of microchannel coolant passages. A very useful summary of recent research in this area is presented in this section and analytical methods for predicting the performance of microchannel heat sinks are discussed in detail. The chapter concludes by describing the aspects of microchannel development that need further investigation.

Chapter 4 presents a review of recent research on MOS electronics and thermal control for cryogenically cooled computer systems. The low temperature characteristics of MOS electronics are first discussed, followed by a description of strategies for thermal control of components operating at cryogenic temperatures. Chapter 5 provides a summary of recent developments in direct liquid cooling of electronic components. The first portion of this chapter is qualitative, describing the design strategies and physical embodiments of direct liquid cooling of chips and other components. The latter part of the fifth chapter discusses the heat transfer mechanisms associated with direct liquid cooling. The qualitative characteristics of the mechanisms are outlined and recent improvements in predicting the heat transfer performance are summarized.

The final chapter of the book is a broad-view summary of recent research on heat transfer in electronic equipment, with an extensive bibliography. Overall, this book is a valuable source of information for electronic packaging designers or practitioners involved in electronics cooling research. It might also be a useful secondary text for a course on electronics thermal control or electronics packaging.

NC Machine Programming and Software Design, Chao-Hwa Chang and Michel A. Melankoff, Prentice Hall Inc., 1989, 589 pages.

Reviewed by Mark A. Fugelso³

This book is a welcome addition to the literature on numerical

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