**Wallis, W. D.**

**Combinatorial designs.** (English) Zbl 0637.05004

Pure and Applied Mathematics, 118. New York etc.: Marcel Dekker, Inc. vii, 329 p. $ 89.75 (US and Canada); $ 107.50 (outside) (1988).

In the past four years, four texts concerning combinatorial designs have appeared. *T. Beth*, *D. Jungnickel* and *H. Lenz* [Design theory (1985; Zbl 0569.05002)] is an ambitious treatment of classical design theory with emphasis on geometric aspects. *D. R. Hughes* and *F. C. Piper* [Design theory (1985; Zbl 0561.05009)] is a shorter text which focuses entirely on classical combinatorial designs and the geometric interpretation and construction of designs. *A. P. Street* and *D. J. Street* [Combinatorics and experimental design (1987; Zbl 0622.05001)] considers both classical designs and more recently studies variants, and emphasizes connections with experimental design. The author has succeeded in writing a text which is a valuable addition. He has sampled topics very widely from combinatorial design theory, covering the fundamentals of classical design theory but still capturing the flavour of much research on variants of designs such as one-factorizations and Room squares. The style is not encyclopaedic; the choice of particular advanced topics emphasizes basic trends in modern design theory rather than providing a comprehensive survey. This style should prove very accessible to those looking for an introduction to designs.

Chapters 1 and 2 introduce block designs, t-designs and pairwise balanced designs. Chapters 3-5 develop some classical constructions of designs, using algebraic, number-theoretic and geometric properties.

Chapter 6 concludes the basic presentation of block designs with a discussion of residual and derived designs, resolvability, and the Bruck- Ryser-Chowla theorem. Chapter 7 presents basic material on t-designs, notably on extensions of designs.

Chapters 8-13 concern more specialized topics: Hadamard matrices, one- factorizations, Latin squares, triple systems and Room squares. In each case, the reader is brought to the research frontier, so that reading current research in the area after this point should be possible.

Chapter 14 primarily introduces Wilson's existence theory. The presentation is precise and clear, but perhaps underemphasized given its importance in present day design theory. Finally, solutions and hints for all exercises are given.

This text is useful as an introduction to design theory for any student, and provides as solid foundation for beginning research in the area.

Reviewer: C.J.Colbourn

**MSC:**

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| 05B05 | Combinatorial aspects of block designs |
| 05-01 | Introductory exposition (textbooks, tutorial papers, etc.) pertaining to combinatorics |
| 05B30 | Other designs, configurations |



**Keywords:**

block designs; t-designs; pairwise balanced designs; Hadamard matrices; one-factorizations; Latin squares; triple systems; Room squares