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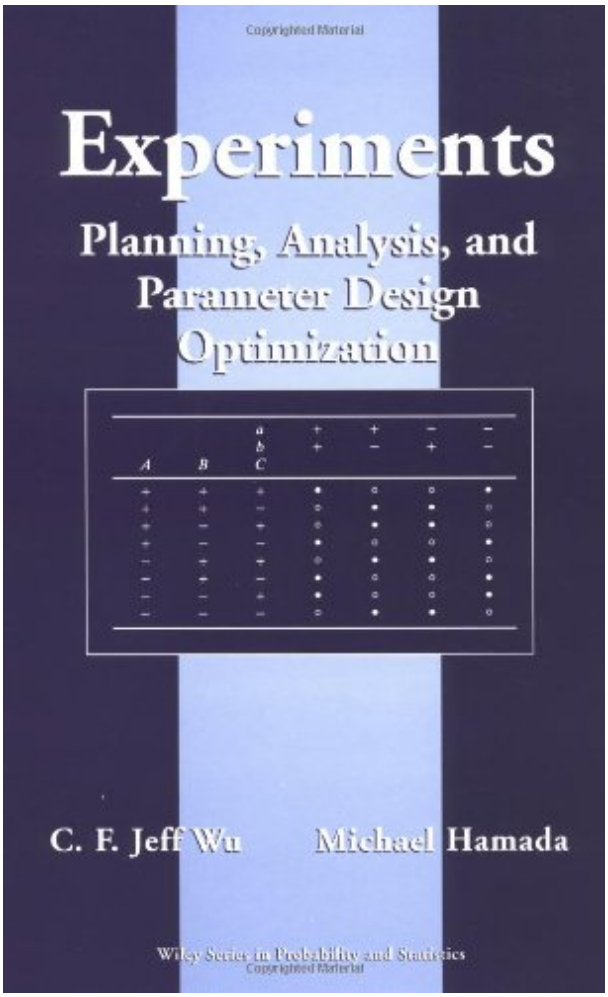

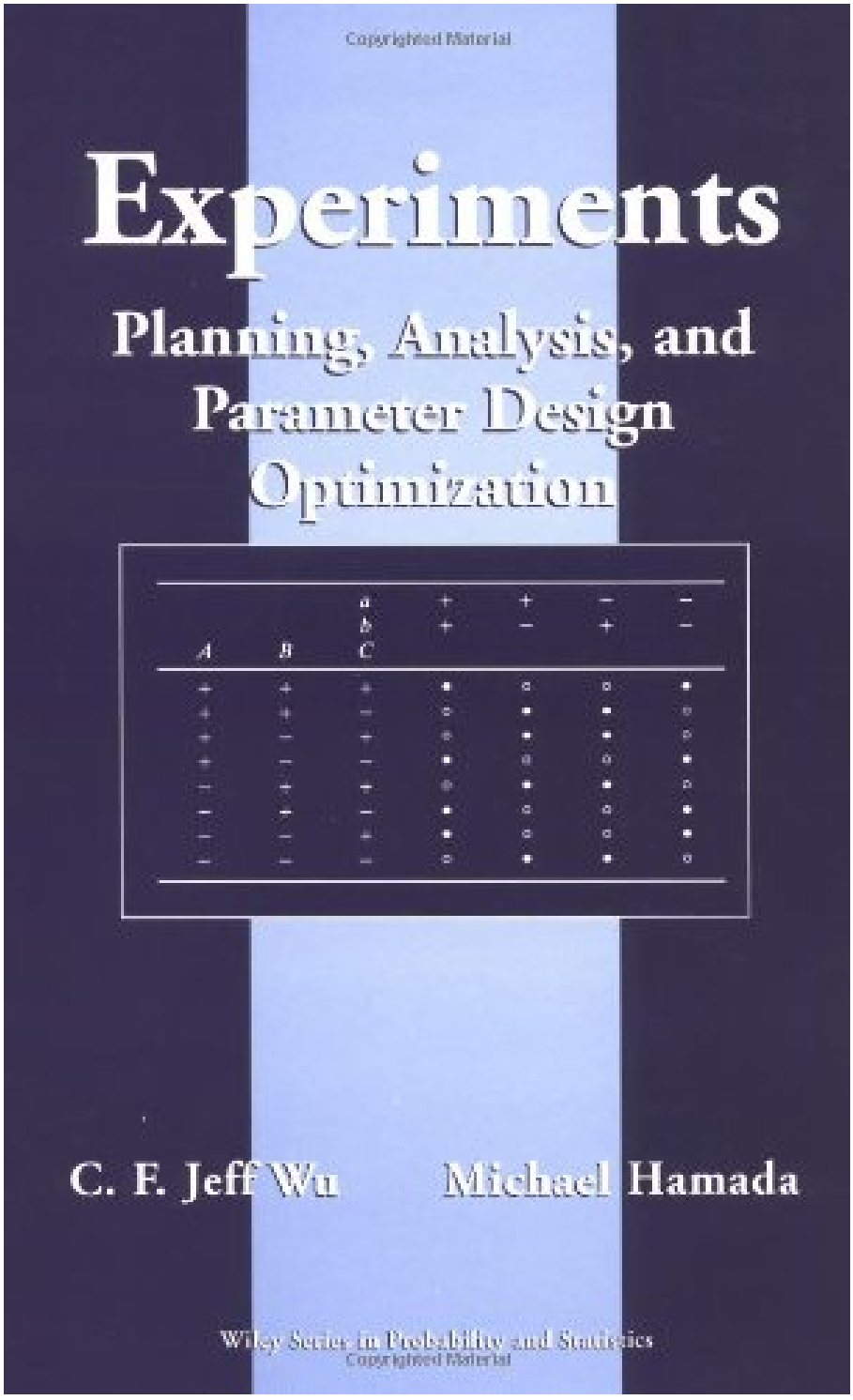

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Review

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About the Author

C. F. JEFF WU, PhD, is H. C. Carver Professor, Department of Statistics and Industrial and Operations Engineering, University of Michigan, Ann Arbor. He is a Fellow of the American Statistical Association and the Institute of Mathematical Statistics, and a recipient of the COPSS Award and numerous other awards and prizes. He is the author of about 100 published papers.

MICHAEL HAMADA, PhD, is a technical staff member in the Statistical Sciences Group at Los Alamos National Laboratory in New Mexico. He has published 30 papers and has won the Technometrics Wilcoxon Prize and the ASQC Brumbaugh Award.

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modern and thorough text that includes Taguchi designs
By Michael R. Chernick
My review of this book was for the first edition. But as a practice (not a particularly good one) when amazon gets a later edition of a book (in this case a second edition)they keep the old reviews and do not inform the reader that the reviews were for an earlier edition. Also amazon has a policy of only allowing one review per reviewer. So even though I have the second edition I can not write a separated review. So my choice here is to put the review of the sedond edition in front of the review of the first on an edited review.

The first edition was mainly intended as a graduate text in experimental design with some emphasis on the theoretical development of robust designs (included what are called Taguchi designs). After the experience of teaching out of the text and based on feedback from ther instructors the authors found that there was value in expanding an already large volume to make it accessible to undergraduate students including students who do not have background in regression analysis. So a new Chapter 1 provides that introduction. Also Chapter 2 provides a more gentle introduction to design. The contents of chapters 1 and 2 covers Chapter 1 of the first edition and more. Chapter 2-13 of the first edition are now Chapters 3-14 in the second. Chapters 3-5 have been reorganized to better suit teaching the subject. Other than the there are a few corrections to errors in the first edition and a marking of the more difficult material so that instructors, particularly those teaching an undergraduate course can skip certain sections. Of course as the research continues to develop some new material and new references have been included. There are 9 new topics mention in the preface including sample size determination and a section on split plot designs. There is more discussion of Bayesian methods and random effects ANOVA models.

The review of the first edition now follows verbatim:
Jeff Wu got his Ph.D. in statistics from UC Berkeley. He started his career at the University of Wisconsin in Madison where he was influenced by George Box and was exposed to many important practical design problems. Jeff quickly established himself as a top notch theoretical statistician publishing some landmark papers in the Annals of Statistics. As his career developed at Wisconsin and later in Canada and at Michigan he made fundamental contributions to survey sampling and experimental design. This book is basically a sequel to the classic book by Box, Hunter and Hunter. It includes all aspects of experimental design and is very thorough in covering all the classical topics and the new area of robust design. It includes many recent advances by the authors (Wu and Hamada) in the 1990 and even the late 1990s (papers from 1997 and 1998 are referenced).
The book is intended for scientists and engineers as well as statisticians. The authors deliberately introduce the concepts gently, starting with a real problem and constructing and analyzing a design type considered in the chapter. This is done consistently from chapters 3-13.

They start with the simplest ideas and designs and build up. Chapter 1 deals with single factor experiments and Chapter 2 with experiments with more than one factor, starting with two. Section 1.1 provides an historical perspective which I find valuable. It leads to a classification of design problems that are distinct and they show how they arose in very different contexts. They do a good job of setting the stage for the remaining chapters. The categories are (1)Treatment Comparisons (the traditional agricultural experiment),

(2) Variable Screening, (3) Response Surface Exploration, (4) System Optimization and (5) System Robustness. Although the theory of optimal designs is not covered in detail, the role of optimal designs is mentioned as is the early work of Kiefer (section 4.4.2)and reference to the recent book by Pukelsheim is given.

In Chapter 4 on fractional factorial experiments at two levels, concepts of resolution and aberration are clearly explained. I think it helps that the authors make these concepts concrete through the illustrative examples. I have often looked at standard design texts and found myself confused about the distinction between resolution III, IV and V designs.

There are several features that set this book apart from other books on design of experiments. Some attention is given to the one-factor-at-a-time approach. Most books ignore this commonly used approach and its many drawbacks. The authors explain its four main disadvantages and illustrate the problem with a design example. In my experience in industry, many engineers are not trained well in statistics and although it may seem clear to statisticians that one-at-a-time approaches overlook interactions or dependencies between variables, the engineers often do not. They see this approach as a way to simplify their search for the best operating conditions. I published an article in the mathematical modeling literature that also was intended to demonstrate the value of statistical design methods over the one-at-a-time approach. Latin square and Graeco-Latin Squares are covered as well as the more common factorial and fractional factorial designs. They also cover randomized blocks and balanced incomplete blocks. The concept of pairing (blocking) is well illustrated with a particular analysis of variance done both with and without pairing. Underlying assumptions are brought out and never hidden. The principles that are the basis for selection of fractional factorial designs are made explcit. Practical nonregular designs including the popular Plackett-Burman designs are well covered. Chapter 10 provides the basis and motivation for robust parameter designs. It also includes a discussion of the signal-to-noise ratio approach of Taguchi and describes some of its weaknesses. Chapter 11 looks at various performance measures for robust parameter design and compares several designs with respect to these parameters.

In the early chapters, the analysis of variance is presented clearly with all the required assumptions. Multiple comparison methods are discussed. Good references, both recent and old, are provided on each topic. My only disappointment was the omission of the recent resampling approaches to p-value adjustment due primarily to Westfall and Young.

Another interesting and unique aspect of the book is the presentation of Bayesian variable selection strategies. This introduces much of the interesting new work in Bayesian methods using the Markov Chain Monte Carlo methods.

Chapters 12 and 13 cover topics you will not find in other experimental design books. Chapter 12 deals with experiments to improve reliability and 13 with nonnormal data. Use of generalized linear models and transformation of variables is well covered in the book.

This book is a worthy sequel to Box, Hunter and Hunter. It is a great introductory book for experimental design courses and a great reference source for scientists, engineers and statisticians. It is already gaining in popularity.

0 of 0 people found the following review helpful.
Nice examples!
By Amazon Customer
This book contains good examples. I like the fact it deals with variability topics within DOE.

35 of 40 people found the following review helpful.
Not in touch with Grad Students...
By Drew Balazs
I think this book has great potential. Unfortunately, it suffers from a few of the most fairly common Graduate Level text book problems.
Use of the 'et cetera' function, or a failure to work out examples. I'm not sure if I'm in a minority with this opinion, but I believe, after many years as a graduate student that examples should be worked on in their entirety. Unfortunately, this in not the case with this textbook. There are numerous places in this text where the authors reference, with great generality, pervious half-worked examples or formulas. Not only does this make the text sometimes difficult to follow, it also reduces the usefulness of the book as a self teaching tool.
The text also fails to include even some of the solutions to its exercises. I'm not sure why many authors fail to include even some of the solutions to their chapter exercises. In my opinion, I believe that this is a serious weakness in text. Most professors who teach graduate level courses create their own problem sets. By failing to include even partial solution sets, the authors minimizes or completely destroys any benefit of including exercises in the text (especially if you are not reading this text as part of a course). There is no benefit of working out exercises if you can not correct or even identify your mistakes.
If I had to have just one "Design of Experiments" book, I would not choose this one. Although there are many great things about this book, it is notoriously light on Split-Plot experiments. In fact, Split-plot experiments (which are very common) only receive a cursory mention. If you are looking for Books on Designs of experiments, I suggest you look at "Design and Analysis of Experiments" by Douglas Montgomery, or maybe even the older "Statistical Design and Analysis of Experiments" by Mason, Gunst, and Hess.

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