

Basic Engineering Data Collection and Analysis

By Stephen B. Vardeman, John Marcus Jobe



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Stephen Vardeman and J. Marcus Jobe's motivating new book is appropriate for students in introductory engineering statistics courses, including chemical, mechanical, environmental, civil, electrical, and industrial. The authors stress the practical issues in data collection and the interpretation of the results of statistical studies over mathematical theory. Using real data and scenario examples along with chapter-long case studies to teach readers how to apply statistical methods, the book clearly and patiently helps students learn to solve engineering problems. The book's practical, applied approach encourages students to "do" statistics by carrying data collection and analysis projects all the way from problem formulation to preparation of professional technical reports.

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Editorial Review

Review

1. INTRODUCTION Engineering Statistics: What and Why? / Basic Terminology / Measurement: Its Importance and Difficulty / Mathematical Models, Reality and Data Analysis 2. DATA COLLECTION General Principles in the Collection of Engineering Data / Sampling in Enumerative Studies / Principles for Effective Experimentation / Some Common Experimental Plans / Preparing to Collect Engineering Data 3. ELEMENTARY DESCRIPTIVE STATISTICS Elementary Graphical and Tabular Treatment of Quantitative Data / Quantiles and Related Graphical Tools / Standard Numerical Summary Measures / Descriptive Statistics for Qualitative and Count Data (Optional) 4. DESCRIBING RELATIONSHIPS BETWEEN VARIABLES Fitting a Line by Least Squares / Fitting Curves and Surfaces by Least Squares / Fitted Effects for Factorial Data / Transformations and Choice of Measurement Scale (Optional) 5. THE PROBABILITY: THE MATHEMATICS OF RANDOMNESS (Discrete) Random Variables / Continuous Random Variables / Probability Plotting (Optional) / Joint Distributions and Independence / Functions of Several Random Variables 6. INTRODUCTION TO FORMAL STATISTICAL INFERENCE Large-Sample Confidence Intervals for a Mean / Large-Sample Significance Tests for a Mean / One-and Two-Sample Inference Means / One- and Two-Sample Inference for Variances / One- and Two-Sample Inference for Proportions / Prediction and Tolerance Intervals 7. INFERENCE OF UNSTRUCTURED MULTISAMPLE STUDIES The One-Way Normal Method / Simple Confidence Intervals in Multisample Studies / Two Simultaneous Confidence Interval Methods / The One-Way Analysis of Variance (ANOVA) / Shewhart Control Charts for Measurement Data / Shewhart Control Charts for Qualitative and Count Data 8. INFERENCE FOR FULL AND FRACTIONAL FACTORIAL STUDIES Basic Inference in Two-Way Factorials with Some Replication / p-Factor Studies with Two Levels for Each Factor / Standard Fractions of Two-Level Factorials; Part I: 1/2 Fractions / Standard Fractions of Two-Level Factorials; Part II: General 2"p-1" Studies 9. REGRESSION ANALYSIS-INFERENCE FOR CURVE- AND SURFACE-FITTING Inference Methods Related to Least Squares Fitting of a Line (Simple Linear Method) / Inference Methods for General Least Squares Curve- and Surface-Fitting (Multiple Linear Regression) / Application of Multiple Regression in Response Surface Problems and Factorial Analyses / APPENDIXES / A: MORE ON PROBABILITY AND MODEL FITTING / B: TABLES / ANSWERS TO END-OF-SECTION EXERCISES / INDEX

About the Author

Steve Vardeman is a Professor of Statistics and Industrial Engineering at Iowa State University. He holds a 1975 Ph.D. in Statistics from Michigan State University and B.S. and M.S. degrees in Mathematics from Iowa State. He is a Fellow of the American Statistical Association, an elected Ordinary Member of the International Statistical Institute, a Senior Member of the American Society for Quality and is a member of both the American Society for Engineering Education and the Institute of Mathematical Statistics. His book Statistics for Engineering Problem Solving won the 1994 ASEE Meriam-Wiley Distinguished Author Award for an outstanding new engineering textbook, he is co-author of Statistical Quality Assurance Methods for Engineers, and the ISU College of Liberal Arts and Sciences has recognized him for outstanding teaching. He was Editor of Technometrics from 1993 to 1995 and both his research and teaching interests revolve around the engineering applications of statistics.

John Marcus Jobe currently teaches in the Department of Decision Sciences and Management Information Systems at the University of Ohio, where he teaches courses in business statistics, regression, statistical quality control, design of experiments in business, multivariate methods in business, and industrial statistics. Research focuses on quality improvement, regression, and application of designed experiments. Dr. Jobe holds a bachelor's degree from Central State University (1977), a masters of science degree from Oklahoma State University (1979), and a Ph.D. from Iowa State University (1984). He is the recipient of many distinguished research and teaching honors, including being named a Senior Fulbright Scholar, Kiev State University of Trade and Economics, Kiev, Ukraine, 1996-97. He also received the Outstanding Teaching Award, Miami University, All University Award in1995, and a NASA Research Fellowship in 1991 and 1992. In 1986 and 1987, he was recognized by the Air-Force Office of Scientific Research (AFOSR). He is the author of many papers and research articles, and served as co-author on another text with Steve Vardeman, STATISTICAL QUALITY IMPROVEMENT METHODS FOR ENGINEERS, published by John Wiley & Sons, 1998.

Users Review

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