Process Optimization: A Statistical Approach

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PROCESS OPTIMIZATION: A Statistical Approach is a textbook for a course in Response Surface Methodology and experimental optimization techniques for industrial production processes and other "noisy" systems where the main emphasis is process optimization. The book can also be used as a reference text by Industrial, Quality and Process Engineers and Applied Statisticians working in industry, in particular, in semiconductor/electronics manufacturing and in biotech manufacturing industries. The major features of PROCESS OPTIMIZATION: A Statistical Approach are: It provides a complete exposition of mainstream experimental design techniques, including designs for first and second order models, response surface and optimal designs; Discusses mainstream response surface method in detail, including unconstrained and constrained (i.e., ridge analysis and dual and multiple response) approaches; Includes an extensive discussion of Robust Parameter Design (RPD) problems, including experimental design issues such as Split Plot designs and recent optimization approaches used for RPD; Presents a detailed treatment of Bayesian Optimization approaches based on experimental data (including an introduction to Bayesian inference), including single and multiple response optimization and model robust optimization; Provides an in-depth presentation of the statistical issues that arise in optimization problems, including confidence regions on the optimal settings of a process, stopping rules in experimental optimization and more; Contains a discussion on robust optimization methods as used in mathematical programming and their application in response surface optimization; Offers software programs written in MATLAB and MAPLE to implement Bayesian and frequentist process optimization methods; Provides an introduction to the optimization of computer and simulation experiments including and introduction to stochastic approximation and stochastic perturbation stochastic approximation (SPSA) methods; Includes an introduction to Kriging methods and experimental design for computer experiments; Provides extensive appendices on Linear Regression, ANOVA, and Optimization Results.

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