DOE Screening Experiments Course Outline

UNIT 1 BACKGROUND FOR DOE

Lesson 1 | Why DOE?

- Limitations of OATs (one-at-a-time) experimentation.
- How designed experiments overcome the limitations of OATs and are a more effective and efficient way to characterize and improve processes and products.

Lesson 2 | DOE Terminology

- An explanation of the key terms used in designed experiments.

Lesson 3 | Types of Designed Experiments

- Full Factorials
- Fractional Factorials
- Screening Experiments
- Response Surface Analysis
- EVOP
- Mixture Experiments

Lesson 4 | Tests of Significance

- Alpha and Beta Risks
- Degrees of Freedom
- Hypothesis Tests
- t-Tests
- F-Tests

Lesson 5 | Setting Up a Designed Experiment

- Design & Communicate the Objective
- Define the Process
- Select a Response and Measurement System
- Select Factors to be Studied
- Select the Experimental Design
- Set Factor Levels
- Final Design Considerations

Unit 1 Challenge

- An assessment of the learner's progress in this unit.

UNIT 2 PLACKETT-BURMAN EXPERIMENTS

Lesson 1 | Plackett-Burman Matrices

- The derivation of Plackett-Burman designs.
- Types of Plackett-Burman matrices.
- Ways to determine the experimental error.
- Techniques for analyzing experimental results.

Lesson 2 | Calculating Statistical Significance

- Multiple techniques for testing the statistical significance of factor effects.
- Using graphical techniques to analyze responses and interactions.

Lesson 3 | Calculating a Prediction Equation

- Developing a prediction equation using factor effects.
- Using the prediction equation to optimize the process or product.

Lesson 4 | Analyzing for Effect on Variation

- How to analyze variation as a response.
- Creating a scree diagram to graphically analyze factor effects on variation.

Lesson 5 | When Bad Things Happen to Good Experiments

- The need for good planning to prevent problems.
- Some techniques for salvaging an experiment if data are lost or suspect.

Unit 2 Challenge

- An assessment of the learner's progress in this unit.

UNIT 3 TAGUCHI TECHNIQUES

Lesson 1 | Taguchi Concepts

- The concept of robustness.
- The Taguchi Loss Function.
- Signal to noise ratios.

Lesson 2 | Taguchi Matrices

- Taguchi designs for two-level experiments.
- Use of Taguchi Interaction Tables.

Lesson 3 | Taguchi Experimental Analysis

- Multiple techniques for testing the statistical significance of factor effects.
- Using graphical techniques to analyze responses and interactions.

Lesson 4 | Determining Where to Set Factors

- Developing a prediction equation.
- Use the mean, signal to noise ratio, and variation effects to determine where to set factors.

Lesson 5 | When Bad Things Happen to Good Experiments

- The need for good planning to prevent problems.
- Some techniques for salvaging an experiment if data are lost or suspect.

Unit 3 Challenge

- An assessment of the learner's progress in this unit.