## Course Description

# DFSS Foundations (aka Operational Design of Experiments)

This five-day course provides the practitioner with the ability to apply the best tools and methods from combinatorial testing and DOE. It covers the key terminology of DOE and various options to testing, showing why DOE is the most effective and efficient testing approach. This course covers the activities that must precede a DOE, including the first line of defense against variation and Measurement System Analysis (MSA). Testing strategies, such as screening, modeling, and confirmation are discussed along with how they fit into an integrated developmental and operational testing strategy. The 12-step approach to experimental design is presented to provide a framework for adequately considering all aspects of the test. Basic graphical and statistical analysis of experimental data are also covered. The concept of, and the need for looking for variance shifting factors are presented, along with screening designs. Response surface designs such as Box-Behnken and Central Composite Designs are shown to be more efficient than factorial designs for modeling non-linear responses.

Simple Rules of Thumb are provided for sample size and design selection, along with determining significance and power. Interpreting regression output and the coding of factors and their levels, along with residual analysis, will facilitate the analysis of data not collected under a DOE strategy and provide a means of analyzing data coming from multiple test scenarios. High Throughput Testing (HTT) provides a combinatorial testing approach that is extremely useful in operational testing when there are many factors, both qualitative and quantitative, each with many and differing levels. HTT is shown to provide superb test coverage at much lower cost than traditional designs. Latin Hypercube Sampling and Descriptive Sampling are shown to be very useful space-filling designs in high dimensions when only a limited number of tests can be conducted. Nearly Orthogonal Latin Hypercube Designs are discussed and will provide the practitioner with power in screening many variables, such as is the case when dealing with high fidelity simulation models from which low fidelity models (transfer functions) can be developed for prediction, optimization, and risk assessment purposes. This course covers many examples in the world of test and evaluation and gives the student practice at test design and analyzing test results. It provides the practitioner with the ability and rationale to make good decisions when conducting both developmental and operational tests under a wide variety of circumstances. DOE is shown to be the science of data collection as it applies to testing and that it must be in the toolkit of anyone who has something to do with a test and evaluation process—from planning to execution and evaluation.

Materials provided with the course:

Student Notebook/Workbook
Textbooks: ***Understanding Industrial Designed Experiments***
***Design for Six Sigma: The Tool Guide for Practitioners***
Software: SPC XL, DOE Pro, HD Tools, rdExpert Lite