Level 1: Minitab Essentials

In this 2-days foundation course, you will learn to decrease the time required for statistical analysis by quickly learning how to navigate Minitab's user-friendly and customizable environment. Learn how to easily import data and export output. Develop sound statistical approaches to data analysis by learning how to create and interpret a wide variety of graphs. Augment your graphical analysis by learning the foundation for important statistical concepts such as hypothesis testing and confidence intervals. By analyzing a variety of real world data sets, learn how to match the appropriate statistical tools to your own applications and how to correctly interpret statistical output to reveal problems with a process or to show evidence of an improvement. Learn how to explore your processes through statistical modeling tools that help to uncover and describe relationships between variables. A strong emphasis is placed on making good business decisions based upon the practical application of statistical techniques commonly found in manufacturing, engineering, and research and development endeavors.

Topics covered in the training material include: ODBC, Bar Charts, Histograms, Boxplots, Pareto Charts, Scatterplots, Tables and Chi-Square Analysis, Measures of Location and Variation, t-Tests, Proportion Tests, Tests for Equal Variances, Power and Sample Size, Correlation, Simple Linear and Multiple Regression, ANOVA and GLM

Prerequisite: None. This course is a prerequisite for all other general Minitab courses.

Day 1: Essential I

Title	Objectives
Overview of MINITAB	Understand the Minitab file structure. " Navigate the Minitab environment using the Project Manager. "
Introduction to Minitab	Import data from other software programs. " Create and run Exec files to re-create analysis steps. " Display charts and plots to represent data. " Use Minitab tools to recode data and create new variables. " Restructure data for analysis in Minitab. "
Hypothesis Tests: Continuous Data	Evaluate the difference between a process (population) mean and a target valueusing a 1-sample t-test and confidence intervals. " Assess the power of a hypothesis test using power analysis. " Test for a difference between two population means using a 2-sample t-test. " Test for a difference between paired observations using a paired t-test. "
Hypothesis Tests: Attribute Data	Determine the appropriate sample size for a 1-proportion test. " Determine whether a defect rate is different from the target value using the 1-proportion test. " Determine whether defect rates are different from one another using the 2-proportions test. " Determine whether two categorical variables are associated. "

Equivalence Testing (Optional)	Assess the power of a hypothesis test using power analysis. " Test for a similarity between two population means using a 2-sample Equivalence test. " Test for a similarity between paired observations using a Paired Equivalence test. "

Day 2: Essentials II

Title	**Objectives**
Analysis of Variance	Assess the power of an analysis of variance using power analysis. " Compare group variances using a variance test. " Compare means for samples collected at different levels using a general linear model. " Perform ANOVA with more than one factor. " Interpret interaction plots and multiple comparisons. "
Correlation and Simple Regression	Measure the degree of linear association between two or more variables using correlation. " Model the relationship between a continuous response variable and a predictor variable. "
Multiple Correlation and Regression	Measure the degree of linear association between two or more variables using correlation. " Perform regression analysis with more than one predictor. " Understand the causes and effects of multicollinearity in multiple regression analysis. " Learn about automated procedures that can be used to help determine the final model. "

Level 2: Statistical Quality Analysis

Day 1: Statistical Quality Analysis (Manufacturing)

Develop the necessary skills to successfully evaluate and certify manufacturing and engineering measurement systems. Learn the basic fundamentals of statistical process control and how these important quality tools can provide the necessary evidence to improve and control manufacturing processes. Develop the skills to know when and where to use the various types of control charts available in Minitab for your own processes. Learn how to utilize important capability analysis tools to evaluate your processes relative to internal and customer specifications. The course emphasis is placed on teaching quality tools as they relate to manufacturing processes.

Tools Covered Include: Gage R&R, Destructive Testing, Gage Linearity and Bias, Attribute Agreement, Variables and Attribute Control Charts, Capability Analysis for Normal, Non-normal and Attribute data

Prerequisite: Minitab Essentials (Level 1 training)

Title	Objectives
Gage Studies for Continuous Data	Determine the adequacy of measurement systems. " Understand the difference between crossed and nested Gage R&R studies. " Calculate statistics to assess the linearity and bias of a measurement system. "
Attribute Agreement Analysis	Assess the consistency of ratings within each appraiser and between different appraisers. " Assess the correctness of appraiser responses by comparing the responses to aknown standard. " Calculate statistics to assess agreement between appraisers. " Calculate statistics to evaluate the association between appraiser assessments. "
Control Charts: Continuous Data	Choose the appropriate control chart to analyze continuous data. " Monitor process control using control charts for continuous data. " Determine whether variability has a special cause. "
Control Charts: Attributes Data	Choose the appropriate control chart to analyze attributes data. " Monitor process control using control charts for attributes data. " Determine when a special cause of variability has occurred. "
Capability Analysis: Continuous Data	Understand the assumptions of process capability. " Analyze the capability of a stable process. " Identify an appropriate distribution for data that are not normally distributed. " Analyze the capability of a process using a nonnormal distribution. " Analyze the capability of a process using Box-Cox and Johnson transformations. "
Capability Analysis: Attributes Data	Understand capability analysis for attributes data. " Assess the capability of a process when the data follow a binomial distribution. " Assess the capability of a process when the data follow a Poisson distribution. "

Day 2: Additional Topics in Statistical Quality Analysis (Manufacturing)

Continue to build on the fundamental concepts taught in the Manufacturing Statistical Quality Analysis course by learning additional tools that help to improve and control your processes. Develop the necessary skills to successfully evaluate and certify manufacturing and engineering measurement systems with multiple gages or locations on a part. Learn how to evaluate a random sample of product from a lot to determine whether to accept or reject the entire lot. Expand your knowledge of control charting to handle rare events and time weighted data. Learn how to utilize important capability analysis tools to evaluate your processes relative to internal and customer specifications. The course emphasis is placed on teaching quality tools as they relate to manufacturing processes.
Topics covered in the training material include: Gage R&R Expanded, Orthogonal Regression, Tolerance Intervals, Acceptance Sampling, Between-Within Analysis, Control Charts including EWMA, Short-Run, and Rare Events
Prerequisite: Minitab Essentials (Level 1 training), Statistical Quality Analysis (day 1)

Gage R&R Expanded	Determine the adequacy of measurement systems. " Use Gage R&R Expanded to assess three factors in a measurement system. "
Orthogonal Regression	Understand the difference between ordinary least squares regression and orthogonal regression. " Analyze a predictor and a response using orthogonal regression when both X andY contain measurement error. " Compare two gages. "
Attribute Agreement Analysis	Assess the consistency of ratings within each appraiser and between different appraisers. " Assess the consistency of appraiser responses by comparing the responses to a known standard. "
Rare Event Charts	Monitor the stability of a rare event with T charts. " Monitor the stability of a rare event with G charts."
Short-Run Control Charts	Monitor short-run processes with a Z-MR chart. "
Time-Weighted Control Charts	Monitor small shifts in the process mean using EWMA and CUSUM charts. "
Between/Within Analyses	Monitor within-subgroup and between-subgroup variation with an I-MR-R/S chart. " Analyze the capability of a process using Capability Analysis - Between/Within. "
Capability Analysis Using Assistant	Compare the capability of a process after a modification using Assistant. " Understand the difference between Capability Snapshot and a full capability analysis. " Analyze the capability of a limited data set. "
Tolerance Intervals	Learn the difference between confidence intervals
Acceptance Sampling	Create and compare acceptance sampling plans for attribute data. " Create and compare acceptance sampling plans for variable data. " Accept or reject lots based on variable inspection data. "

Level 2 & Level 3: Experimental Design

Day 1: (Level 2) Factorial Designs

Learn to generate a variety of full and fractional factorial designs using Minitab's intuitive DOE interface. Real-world applications demonstrate how the concepts of randomization, replication, and blocking form the basis for sound experimentation practices. Develop the skills necessary to correctly analyze resulting data to effectively and efficiently reach experimental objectives. Use Minitab's customizable and powerful graphical displays to interpret and communicate experimental results to improve products and processes, find critical factors that impact important response variables, reduce process variation, and expedite research and development projects.
Tools and topics Covered Include: Design of Factorial Experiments; Normal Effects Plot and Pareto of Effects; Power and Sample Size; Main Effect, Interaction, and Cube Plots; Center Points; Overlaid Contour Plots; Multiple Response Optimization

Prerequisites: Minitab Essentials

Title	**Objectives**
Overview of Designed Experiments	Understand the strategy of designed experiments " Recognize the types of experiments available in Minitab. "
Introduction to Factorial Designs	Create a factorial design and learn about design principles and properties " Calculate and interpret main effects and interactions. " Analyze a full factorial design
Full Factorial Designs	Perform a power analysis to evaluate differences detected in designed experiments " Evaluate the impact of adding replicates on power " Understand the role of blocking in a designed experiment. " Examine the impact of outliers on results and residual plots "
Fractional Factorial Designs	Reduce the number of experimental runs using fractional factorial designs. " Examine the impact of outliers on results and residual plots. " Apply sequential experimentation to fit a model. " Use center points to improve power
Multiple Response Optimization	Use the response optimizer and overlaid contour plot to optimize multiple responses. " Find factor settings that optimize multiple response variables. "

Day 2: (Level 3) DOE in Practice

Learn how to handle common DOE scenarios where classic factorial or response surface design and analysis techniques are neither appropriate nor possible due to the nature of the response variable or the data collection process. Develop techniques for experimental situations often encountered in practice such as missing data and hard-to-change factors. Understand how to account for variables (covariates) that may affect the response but cannot be controlled in the experiment. Explore the opportunities to minimize costs or variability while simultaneously optimizing an important product or process characteristic. Learn how to find and quantify the effect that factors have on the probability of a critical event, such as a defect, occurring.

Topics and Tools Covered Include: Analize Variability, ANCOVA, Missing Data in Experiment, Split-Plot Designs, Cost Optimization, Experiment with Binary Response,
Prerequisites: Introduction to Minitab, Basic Statistics, and Factorial Designs
Prerequisites: Level-1 (Essentials) and Level-2 (Factorial Designs)

Title	**Objectives**
Analyze Variability	• Analyze response variation in factorial experiments. • Find factor settings that minimize variation and meet a target response.
Analysis of Covariance	• Define a covariate and understand its role in a designed experiment. • Study the relationship between a covariate and the response variable in a designed experiment. • Reduce the error present in the model and give factor tests more power by including a covariate in a designed experiment. • Isolate the effect of the factors in a designed experiment by using a covariate to adjust the response.
Missing Data in a Designed Experiment	• Recognize common scenarios that result in missing data • Identify outliers in a designed experiment. • Apply techniques to handle missing data in a designed experiment.
Split-Plot Designs for Hard-to-Change Variables	• Design a split-plot experiment with a hard-to-change factor. • Analyze a split-plot experiment with a hard-to-change factor.
Cost Optimization	• Create a cost column for a process optimization. • Analyze data from a central composite design. • Determine cost-effective settings using the multiple response optimizer.
Experiment with Binary Response	• Determine which factors and covariates affect a binary response. • Interpret the regression coefficients and odds ratios. • Display the binary logistic regression prediction equation.