Engineering Statistics

Course No. 435

FOR WHOM INTENDED An understanding of Statistics is required in the implementation of uncertainty calculations in Metrology such as: statistical and probability concepts in measurements, confidence levels and control charts.

An understanding of statistics is also required in the analysis and measurement procedures for Random Vibration, where the various probability distributions, such as Gaussian (normal), Chi-Square, student t and F distributions and confidence levels and statistical independence play an important role.

BRIEF COURSE DESCRIPTION This TTi course covers all the usual topics in reliability and statistics and explains how the theory is applied in engineering.

In the study of basic statistics, students encounter equations which are not "user friendly." The volume of statistical formulas and the "number-crunching" has made the true learning and application of statistics difficult for most people. In this course the actual evaluation of statistical formulas is done using programmable calculators such as the TI-82 and TI-83, which simplify the process and save hours of tedious work. This enables the student to devote more time to the overall understanding of basic statistics and applying the concepts learned.

DIPLOMA PROGRAMS This course may be used as an elective for any TTi specialist diploma program.

PREREQUISITES There are no definite prerequisites for this course. However, prior completion of TTi Distance Learning course 103-2 "Applied Mathematics" would be helpful.

RELATED COURSES This course is presented concurrently with the first day of course 132-4, Measurement Uncertainty.

TEXT Each student will receive 180 days access to the on-line electronic course workbook. Renewals and printed textbooks are available for an additional fee.

COURSE HOURS, CERTIFICATE AND CEUs Class hours/days for on-site courses can vary from 14–35 hours over 2–5 days as requested by our clients. Upon successful course completion, each participant receives a certificate of completion and one Continuing Education Unit (CEU) for every ten class hours.

INTERNET COMPLETE COURSE 435 features almost 8 hours of video as well as more in-depth reading material. All chapters of course 435 are also available as OnDemand Internet Short Topics. See the on-line course outline for details.

Course Outline

Introduction
   Definitions • Populations • Data Groups, Variables
   Class Intervals • Frequency Distribution
   Continuous Distributions • Continuous Distributions Histogram:
      Equal Class Size, Unequal Class Size
   Frequency Curves • Cumulative Frequency Curve or Ogive
Measures of Data Spread
   Central Tendency • Arithmetic Mean • Arithmetic Mean
   Median and Mode • Frequency Distributions
Measures of Dispersion
   Dispersion—Mean Deviation • Mean Deviation Example
   Variance • Variance—Example • Standard Deviation
Worked Example
   Raw Data • Classes • Exact Class Limits
   Frequency Distribution Graph
   Cumulative Frequency Distribution (cf)
   Arithmetic Mean for Grouped Data • Arithmetic Mean
   Median for Grouped Data Set
   Sample Standard Deviation of Grouped Data Set
Probability
   Probability Exercise • Random Data (Tossing Coins)
   Expressing Probability • Venn Diagram • Rules of Addition
   Theory of Intersection • Rules of Multiplication
   Bayes Theorem • Hypothesis • Test • Null Hypothesis (H_0)
   Critical Region • Test Statistic • Level of Significance
Distributions
   Binomial Experiment • Binomial Population • Variables
   Continuous Distribution • Continuous Probability Distribution
   Normal Distribution • Standard Normal Distribution
   Gaussian (s-Normal) Distribution • One-Tailed Test
   Two-Tailed Test • Type I and II Errors • Statistical Significance
   Confidence Intervals • Confidence Levels
   Computing the Standard Deviation—Example
More Distributions
   Chi-Square (χ^2) Distribution • Binomial Distribution
   Binomial Distribution Graph • Poisson Distribution
   Student's t-Distribution • Table: t-Distribution • F-Distribution
   Table: Critical Values for the F-test
Correlation and Regression
   Goodness-of-Fit Tests • Correlation • Scatter Diagram
   Regression Analysis • Regression • Method of Least Squares
   Linear Regression
Summary and Final Review
Award of Certificates for Successful Completion
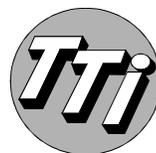
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