Digital Manufacturing – Industry 4.0

This is the course 41740 Digital Manufacturing – Industry 4.0 on Denmark Technical University (DTU). The main goal of this course is to provide students with an understanding and a portfolio of actionable tools (technique) for the optimization of manufacturing processes.

Module 02 – Statistical Tools 1

Comparative Tests

- Comparing Two Moulds
  - Compare performance of standard injection mould (A) against a new one that is produced through additive manufacturing (B).
  - Considering only the average without considering the spread is not enough.

Analysis of Variance

- Analysis of Variance (ANOVA)
  - Is a statistical tool used to analyse and understand the sources of variation in a manufacturing or industrial process. ANOVA can be applying to analyse data collected from these processes to identify factors that significantly affect the variability in the outcomes.
- Following components:
  - Sources of Variation: Sources of variation can include factors like machine settings, production methods, environmental conditions, and more. These factors can be categorized as either fixed or random.
  - Sum of squares (SS): This represents the variability attributed to each source of variation. It quantifies how much the dependent variable varies due to each factor being considered.
  - Degrees of Freedom (df): Degrees of freedom are associated with each source of variation and are used to calculate the mean squares. They are a measure of how much variability is a allowed within each source.
  - Mean Squares (MS): Mean Squares are obtained by dividing the sum of squares by the degrees of freedom. They represent the average variation within each source.
  - F-statistic (F-value): The F-statistic is calculated by dividing the mean square of the factor of interest by the mean square of the residual variation.
  - P-value: The p-value associated with the F-statistic is used to assess the statistical significance of the factor.