

# Advanced Statistics Course



***How do you plan and organize experiments? And how do you analyze the data for fact based decision making? These are themes that many engineers have to deal with. The usage of statistical software allows you to make a transparent experiment planning, test on project specific hypotheses and last but not least make a useful presentation of the results.***

**Plan, execute and analyze a designed experiment!**

**Register: [www.holland-innovative.nl](http://www.holland-innovative.nl)**

## **The aim of the training**

This three day training will revitalize and enhance your knowledge of statistics in such a way that you can use statistical tools to plan and analyze complex experiments. This course will recapitulate and connect to the headlines of the Basic Course. Theory and practice alternate by use of a catapult game to experience how to set up a good design of experiments in practice. Practical examples and exercises are used throughout the training to illustrate the theory and to let the course participants getting acquainted with Minitab®.

## **What will be learned - the skills**

This training builds upon the statistical methods learned in the Basic Statistics Course. The focus in this course is on 'How to plan, execute and analyze a designed experiment'. A simple and logical 13-step method will be introduced to do this. Most of the statistical techniques required in these steps have already been introduced in the Basic Course. In this course they will be repeated shortly and extended in two ways: new analysis techniques will be introduced and already familiar techniques will be explored deeper.

The emphasis is on creating and analyzing a designed experiment (DOE). You will learn how to set up a designed experiment, how to deal with many parameters in your experiment, with non-linear behavior of your responses, etc. The result of a DOE is a statistical process model. This model can be used to determine optimal settings of your process. Further, you may use the model to investigate the effect of spread on your input parameters on your response. To this purpose the Monte Carlo simulation technique is introduced.

## **Benefit from bringing your own data**

This course is interactive. By doing some practical work, the participants gain experience with the advantages of statistical methods and tools. Bringing your own data and examples to the course is recommended.

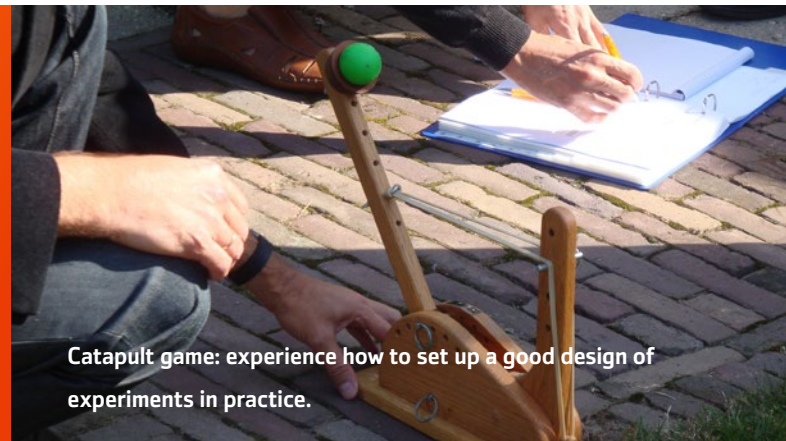
**Course duration and number of participants** 3 Days from 9.00 a.m. to 5.00 p.m. Maximum group size: 16 participants.

**Teacher** Ir. Joost van der Heijden (Holland Innovative)

**Location and costs** Location: Holland Innovative, High Tech Campus 9, Eindhoven. The costs are € 1.475,- (ex VAT) per participant. Included are the three training days, a syllabus of the course material, beverages and lunch.

**Dates, registration and more information** See [www.holland-innovative.nl](http://www.holland-innovative.nl) under Academy.

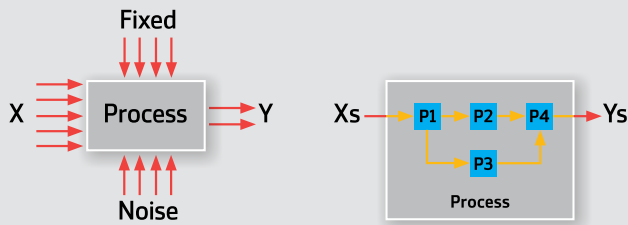
**Contact** HI Team Academy, tel. +31 40 85 14 611, [academy@holland-innovative.nl](mailto:academy@holland-innovative.nl)



**Catapult game: experience how to set up a good design of experiments in practice.**



# Identify Model + Derive Transfer Function



Output  $Y$  of the process is a function of input parameters  $X_1, X_2, \dots, X_n$ .  
We want to know this function  $F$ :  
 $Y = F(X_1, X_2, \dots, X_n) + \text{error}$ .

In general we have two goals:  
Operate process at target & operate process with small variation.  
Additional: find optimum setting of  $Y$  & settings of  $X$  to reach that optimum.

With DOE we can determine transfer function  $F$  and optimize  $Y$ , also suitable for complex systems.

## Target group

This professional and intensive course is suitable for people working in quality & assurance, research & development, service & support and project management. Prerequisite for entering is either the two day Basic Statistics Course or sufficient statistical knowledge and experience with the statistical software package Minitab® via other means, e.g. Six Sigma Green Belt training.

**Level** Academic or HBO level, or equivalent level acquired through working experience.

## Teacher

Teacher and responsible for the content is Ir. Joost van der Heijden. Joost van der Heijden is an experienced Product & Process Specialist and Master Black Belt at Holland Innovative.

## In-Company

Holland Innovative offers this training also as an in-company training. The course can be tailored to needs where necessary.



## Program 3 days course:

- Define your goal - process model
- Measurement system evaluation
- Gather process knowledge
- Search for vital  $X$ 's - hypothesis testing (part 1)
  - t-tests (1 sample, 2 sample, paired t-test)
  - Non-parametrical tests (Sign, Wilcoxon, Mann-Whitney)
- Hypothesis testing (part 2)
  - ANOVA, GLM
  - Regression
- Non-normal data - transformations
- Power and sample size
- Design of experiments
  - Short introduction
  - Fractional factorial designs
  - Response surface designs (CCD, BBD)
  - Split plot designs
- Monte Carlo simulations
- Confirmation run

Participants will use practical examples and exercises throughout the training to illustrate the theory. During the course the statistical software package Minitab® will be used. A laptop with Minitab® (e.g. free 30 days trial version on [www.minitab.com](http://www.minitab.com)) and Excel installed is needed.

December 2018

## Holland Innovative BV:

- For solutions in project management, product & process development and improvement, and reliability
- 30 Professionals with an average of 20 years experience
- Market areas: HighTech Industry, Automotive, Solar & Energy, Healthcare, Agro & Food

