

**Module Description, available in: EN**

## Quality Control

**General Information****Number of ECTS Credits**

3

**Module code**

TSM\_QCheck

**Valid for academic year**

2023-24

**Last modification**

2022-01-05

**Coordinator of the module**

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**Explanations regarding the language definitions for each location:**

- Instruction is given in the language defined below for each location/each time the module is held.
- Documentation is available in the languages defined below. Where documents are in several languages, the percentage distribution is shown (100% = all the documentation).
- The examination is available 100% in the languages shown for each location/each time it is held.

	Lausanne		Lugano	Zurich
<b>Instruction</b>	X E 100%			
<b>Documentation</b>	X E 100%			
<b>Examination</b>	X E 100%	X F 100%		

**Module Category**

TSM Technical scientific module

**Lessons**

2 lecture periods and 1 tutorial period per week

**Entry level competences****Prerequisites, previous knowledge**

Prior to joining the module, the students should be familiar with the basics of statistics (variance, standard deviation, probability density). The student should also understand the concepts of measurement uncertainty, repeatability and reproducibility. Knowledge of design/mechanical drawing reading/tolerancing

**Brief course description of module objectives and content**

Introduction:

- Introduction to Quality Control
- Statistics refresher: Probability distributions, sampling distributions, inference

- Overview of the most commonly used problem-solving tools: histogram, plots, Pareto chart

Problem-solving methodology:

- Quality management approaches: QRQC, A3, 8D, DMAIC, etc.
- Statistical analysis: t-tests, confidence intervals

Introduction to Statistical Process Control :

- Customer and supplier risk
- Acceptable Quality Level
- Acceptance Sampling plans
- Control charts: variable, attribute, multivariate
- Analysis of Variance (ANOVA)
- Process and Measurement System Capabilities
- Gage repeatability and reproducibility, GR&R studies

Design of experiments:

- Process optimization with designed experiments
- Factorial and fractional experimental designs
- Surface response methodology

## Aims, content, methods

### Learning objectives and acquired competencies

At the end of the module, the students should

- Understand the quality management approach
- Understand the functioning and apply the principles of statistical process control
- Be able to estimate the capability of a measuring device for the quality control
- Be able to make a conformity decision
- Be able to evaluate the resulting customer/supplier risks
- Be able to set up a sampling plan for a given Acceptable Quality Level
- Know the most commonly used SPC methods and understand their main limitations.
- Understand the different methods for problem solving
- Be able to setup and analyze a designed experiment for process improvement.
- Understand the main quality wordings.

### Contents of module with emphasis on teaching content

- Introduction to quality management: 10%
- Problem solving methodology: 20%
- Introduction to Statistical Process Control: 20%
- Incoming quality control: 10%
- Metrologic performance and measurement capability: 10%
- Design of Experiments: 20%
- Examples and case studies: 10%

### Teaching and learning methods

- Lectures
- Exercises
- Case studies
- Self-study of SPC methodologies

## Literature

D. Montgomery, "Introduction to Statistical Quality Control", 8th ed., Wiley & Sons (2020)

D. Montgomery, "Design and Analysis of Experiments", 10th ed., Wiley & Sons (2019)

[Quality Trainer](http://qualitytrainer.minitab.com), <http://qualitytrainer.minitab.com>, Minitab

E.L. Cano, J.M. Moguerza and A. Redchuk. "Six Sigma with R. Statistical Engineering for Process Improvement", UseR ! series. Springer, (2012)

M. Pillet, « Six Sigma: Comment l'appliquer », Ed. Eyrolles (2013)

## Assessment

### Certification requirements

Module uses certification requirements

### Certification requirements for final examinations (conditions for attestation)

Evaluation mode: 33% exercises during the semester, 67% written examination

### Basic principle for exams

**As a rule, all the standard final exams for modules and also all resit exams are to be in written form**

### Standard final exam for a module and written resit exam

#### Kind of exam

written

#### Duration of exam

120 minutes

#### Permissible aids

*Aids permitted as specified below:*

#### Permissible electronic aids

- Calculator (without telecommunication functionality)
- Open book

#### Other permissible aids

Pocket language dictionary for non-native English or French speakers

### Special case: Resit exam as oral exam

#### Kind of exam

oral

#### Duration of exam

30 minutes

#### Permissible aids

*Aids permitted as specified below:*

#### Permissible electronic aids

- Calculator (without telecommunication functionality)
- Open Book

#### Other permissible aids

Pocket language dictionary for non-native English or French speakers