**Course Outline**

 This course teaches fundamental principles of PAT (Process Analytical Technology) and QbD (Quality by Design). The course covers core concepts and practical aspects of statistics with the focus of multivariate data analysis and experimental design. Several industrial data are analyzed and a working knowledge of data analysis and experimental design is provided. These methods have a very wide range of applicability to all areas of industries and engineering where data is collected and must be interpreted. Its application in biopharmaceutical will be focused.

**Course Objective**

* Learn how to apply multivariate statistical data analysis, and interpret results
* Learn methodology of data analysis: PCA (Principal Component Analysis); PLS (Partial Least Square); PLS-DA (PLS-Discriminant Analysis)
* Learn how to use data analysis package (SIMCA) by tutorial and class demonstration
* Learn basic concept of batch process monitoring using multiway methods.
* Learn and understand how to monitor process with multivariate statistical process control
* Learn concept of experimental design with screening, optimization and robustness test
* Learn design space concept and setpoint analysis