



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Sas Programming for Clinical Research

2223-2-F8203B035

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#### Learning objectives

The aim of the course is to deepen the students' knowledge of the SAS tools useful for data management, statistical analysis and reporting of clinical and observational studies.

##### *Knowledge and understanding*

This course will provide knowledge and understanding regarding:

- The basis of SAS language;
- The main SAS procedures for data management and analysis of clinical data.

##### *Applying knowledge and understanding*

At the end of the course the students will be able to:

- Manage database with SAS programming language;
- Write the SAS code to perform principal biostatistical analyses;
- Create reporting for clinical and observational studies.

The course will provide a sound basis in SAS programming in the context of the biomedical sciences.

#### Contents

- Introduction to the SAS system

- Longitudinal data and SAS
- SAS procedures for the analysis of clinical trials
- The use of SAS macro language to automate processes
- Implementing statistical algorithms in SAS/IML (interactive matrix language)

## **Detailed program**

### **Course introduction**

Importance of the SAS system in clinical research and the role of the SAS programmer in the pharmaceutical industry.

### **Introduction to the SAS system**

The SAS work environment

Data step and proc step

Data import

Examples of procedures

Data management

SAS functions

Two-way tables

Dates and Formats

Data set merge

PROC SQL

Output delivery system (ODS)

### **Techniques for data management and analysis of longitudinal data in SAS**

Selection of the first and last observation for a patient in a longitudinal study

Wide format and long format

Procedures for the analysis of repeated measures

### **The main procedures for data analysis of a clinical study**

Procedures for the analysis of continuous responses

Procedures for the analysis of binary responses

Procedures for the analysis of survival times

SAS procedures for creating tables (PROC TABULATE) and graphs (PROC SGPLOT and PROC SGPANEL)

### **Use of the SAS macro language process automation**

Macro variables

Macro programs

### **Implementation of statistical algorithms in SAS/IML (interactive matrix language)**

Basic operations in SAS/IML

Statistical applications in SAS/IML

SAS/IML and R

### **Prerequisites**

None

### **Teaching methods**

Lectures and computer exercises with SAS

### **Assessment methods**

Written exam

The written exam consists of a series of short exercises and practical problems that can be solved with SAS tools presented during the course.

The exam is held in the computer lab.

Consultation of the material provided during the course is allowed during the exam.

There are no intermediate exams.

The written exam will test the student's ability to independently use SAS tools in order to solve exercises and practical problems typical of the context of the biomedical sciences.

At student's request, an oral examination could be held.

The examination procedures are the same for attending and non-attending students.

## **Textbooks and Reading Materials**

The course material (book excerpts, articles, SAS code, datasets) will be distributed during the course

## **Semester**

Semester II, cycle II

## **Teaching language**

Italian

## **Sustainable Development Goals**

GOOD HEALTH AND WELL-BEING

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