



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Research Methods

2425-2-I0201D139-I0201D218M

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#### Aims

Basic knowledge of typical sampling schemes, methodological tools of descriptive statistics and inferential statistics to set up studies and to analyse data, with attention to the features of rehabilitation data.

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

- 1) read and discuss scientific literature with descriptive and inferential statistical analyses
- 2) have a solid knowledge to be involved in the the design and implementation of studies in rehabilitation

#### Contents

Basics of probability calculation  
Confidence interval on the parameter  $p$  probability of an event (proportion)  
Frequency tables and graphs  
Order of magnitude and dispersion indicators  
Gaussian Distribution (to approximate the trend of a histogram)  
Confidence interval on the  $\mu$  parameter  
Use of the Gaussian distribution to construct confidence intervals

#### Detailed program

- UNITA' A : Calcolo delle probabilità (Capitolo 5)  
Definizione di esperimento  
Spazio campionario, eventi semplici e composti

Probabilità con approccio classico e frequentista  
Eventi incompatibili, dipendenti e indipendenti  
Probabilità dell'unione e dell'intersezione  
Probabilità condizionata

-----> QUIZ

- UNITA' B : Intervallo di confidenza sulla proporzione  $p$  (Capitolo 9)  
Calcolo della stima puntuale di una probabilità  
Intervallo di confidenza: calcolo della stima intervallare di una probabilità, interpretazione, simulazione  
Pianificazione della stima intervallare di una probabilità

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- UNITA' C : Organizzare e sintetizzare i dati (Capitolo 2 e Capitolo 3)  
Costruzione di una tabella di frequenza per una caratteristica qualitativa: frequenze assolute, relative, relative %  
Rappresentazione grafica con grafici a barre, a torta  
Costruzione di una tabella di frequenza per una caratteristica quantitativa: aggregazione in classi, frequenze assolute, relative, relative %  
Rappresentazione grafica con istogramma  
Indicatori sintetici dell'ordine di grandezza e della variabilità del fenomeno quantitativo: media aritmetica (e/o mediana) e deviazione standard
- UNIT A: Calculation of probabilities (Chapter 5)  
Definition of experiment  
Sample space, simple and compound events  
Probability with classical and Frequentist approach  
Incompatible, dependent and independent events  
Probability of union and intersection  
Conditional probability

-----> QUIZ

- UNIT B: Confidence interval on the proportion  $p$  (Chapter 9)  
Calculation of the point estimate of a probability  
Confidence interval: calculation of the interval estimate of a probability, interpretation, simulation  
Planning the interval estimate of a probability

-----> QUIZ

- UNIT C: Organizing and summarizing data (Chapter 2 and Chapter 3)  
Construction of a frequency table for a qualitative characteristic: absolute, relative, relative frequencies %  
Graphic representation with bar and pie charts  
Construction of a frequency table for a quantitative characteristic: aggregation into classes, absolute, relative, relative % frequencies  
Graphic representation with histogram  
Synthetic indicators of the order of magnitude and variability of the quantitative phenomenon: arithmetic mean (and/or median) and standard deviation

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- UNIT D : Gaussian Distribution and its use as a histogram approximation method (Chapter 7)  
Gaussian distribution: genesis and area calculation method

- UNIT E : Confidence interval on  $\mu$  (Chapter 9)  
Confidence interval: calculation of the interval estimate of a  $\mu$  parameter, interpretation, simulation  
Planning the interval estimation of a  $\mu$  parameter

-----> QUIZ

- UNIT F: Use of the Gaussian distribution to construct the confidence intervals in UNITS B and E  
sample distributions of the proportion and the mean

## **Prerequisites**

None.

## **Teaching form**

Synchronous frontal lessons, asynchronous contents (clips and quizzes).

## **Textbook and teaching resource**

- Book: Fondamenti di statistica Micheal Sullivan III, traduzione a cura di Emma Zavarrone, Pearson 2020, disponibile anche come e-book [https://www.pearson.it/opera/pearson/0-7264-fondamenti\\_di\\_statistica](https://www.pearson.it/opera/pearson/0-7264-fondamenti_di_statistica)
- Slides
- Video clip

## **Semester**

First semester.

## **Assessment method**

Written exam.

## **Office hours**

Under request, via email contact with the instructor.

## Sustainable Development Goals

QUALITY EDUCATION | GENDER EQUALITY

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