UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Design of Experiments

2021-3-E4102B043

Learning objectives

The course aims to provide the conceptual basis and tools for both the construction of basic sample designs in the finite populations. The student must know how to plan, analyze and interpret data of an experimental design.

At the end of the course the student must be able to know how to orientate basilarly in the identification of sample units necessary for carrying out an experimental design.

Knowledge and understanding

This course will provide knowledge and understanding in relation to:

- Main sampling plans from finite populations (case of continuous and dichotomous variables)
- Construction of the total / average / fraction estimator for the different sampling plans
- Main experimental designs
- Analysis of variance (ANOVA) in the context of the design of the experiments

Ability to apply knowledge and understanding

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

- Knowing how to apply the correct sampling plan based on population structure and the type of variable
- Knowing how to build a correct estimator and recognize its properties
- Knowing how to build a correct experimental plan
- Knowing how to perform analysis of variance

The course allows the student to acquire a solid foundation in the application of statistics to the biostatistic/statistical/demographic work context.

Contents

Definition of a sample plan in the presence of finite populations. Analysis of data deriving from an experimentation.

Detailed program

- Sampling from finite populations
- Simple random sample
- Introduction to proportion estimate
- Stratified sampling
- Cluster sampling
- Introduction to panel sampling
- Fully randomized design (one factor)

- One way ANOVA; two or more ways ANOVA
- 2^k factorial design
- Randomized block design.

Prerequisites

No formal prerequisites required

Teaching methods

Lectures of theory and examples in the classroom.

NOTE: During the Covid-19 emergency period, lessons will take place remotely.

Assessment methods

The exam consists of a written test that includes questions of theory and exercises. Sufficiency (18/30) must be achieved in the written test.

Optional oral exam on request of the teacher or the student only if the written test is sufficient.

The written test consists of questions of theory and numerical exercises (to be performed with the calculator). The theoretical questions make it possible to verify the knowledge of the main sampling plans and experimental designs with their characteristics and properties. The exercises allow to verify the ability to choose, calculate and comment on the appropriate sampling plans (and related estimators), experimental plans and ANOVA in the context of simple practical problems. Furthermore, the theoretical questions and the exercises (with the relative comments) allow to verify the ability to express themselves with an appropriate technical language.

During the Covid-19 emergency period, exams will only be online. They will be carried out using the WebEx platform and a public link for the access to the exam will be shown on the e-learning page of the course.

Textbooks and Reading Materials

For sampling techinques:

Frosini B.V., Montinaro M., Nicolini G., Il campionamento da popolazioni finite, UTET, 1999 ; Cochran W.G., Sampling Techniques, J. Wiley, New York, 1977.

For design of experiments:

Cochran W.G., Cox M.G., Experimental Designs, II ed. Wiley, New York, 1992

Montgomery, D.C., Progettazione e analisi degli esperimenti, McGraw-Hill, Milano, 2005

Semester

II Semester, III cycle

Teaching language

Italian