UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Design of Experiments

2425-3-E4102B043

Learning objectives

The course aims to provide the conceptual basis and tools for the construction of basic sample designs in 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 basically apply a survey sampling plan and must also be able to conduct an experimental design.

Knowledge and understanding

This course will provide knowledge and understanding 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 biostatistics/statistical/demographic work context.

Contents

Definition of a sample plan in the presence of finite populations. Analysis of data deriving from 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? factorial design
- Randomized complete block design.

Prerequisites

No formal prerequisites required.
However, knowledge of basic concepts of statistics, probability calculus and inference is strongly recommended.

Teaching methods

Lectures of theory and examples in the classroom.

Classroom lectures: 42 hours

Assessment methods

The exam includes a written test including exercises and open-ended theory questions covering both sample theory and experimental design.

Optional oral exam at the request of the teacher or student only if the written test is sufficient (18/30).

The written test consists of open theory questions and numerical exercises (to be carried out with the calculator). The theoretical questions allow verifying the knowledge of the main sampling plans and experimental designs with their characteristics and properties. The exercises allow you 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. In addition, the theoretical questions and exercises (with related comments) allow you to test your ability to express yourself with adequate technical language.

The oral test consists of exposition of theory topics. The student must be able to expound and argue theoretical

concepts while also knowing how to make connections between different topics.

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

I Semester, II period

Teaching language

Italian

Sustainable Development Goals

QUALITY EDUCATION