**Module:**
Mod.I – Quantitative methods

**Name of course:**
Statistics

**Course Instructor:**
Maura Mezzetti

**Course description:**

This course provides a solid foundation in descriptive statistics, probability theory, and statistical inference, with a strong emphasis on practical applications in political, economic, and social sciences. Students will develop essential skills for analyzing both individual-level and aggregated data, enabling them to interpret and critically evaluate quantitative information relevant to development economics and international cooperation. Hands-on exercises using real-world datasets will reinforce theoretical concepts and prepare students for applied data analysis in research and policy contexts.

**Topics**

**Introduction & Univariate Descriptive Statistics *(3 hours)***

- **Topics**: Types of data; graphical representations (bar charts, histograms, boxplots); measures of central tendency (mean, median, mode) and variability (range, variance, standard deviation).
- **Learning outcomes**: Students will be able to classify data, select appropriate graphical methods, and compute/interpret basic descriptive statistics.

**Bivariate Data Analysis *(3 hours)***

- **Topics**: Relationship between two variables; Chi-square tests for independence (categorical data); correlation coefficients (Pearson and Spearman).
- **Learning outcomes**: Students will understand how to assess associations between variables and interpret measures of correlation.

**Probability *(4 hours)***

- **Topics**: Basic probability concepts; events, sample space, addition and multiplication rules; conditional probability, Discrete and continuous random variables; common distributions (Normal, t, Chi-square, F); sampling distributions.
- **Learning outcomes**: Students will be able to apply basic probability rules to real-world examples and will recognize common probability distributions and understand their role in statistical inference.

**Statistical Inference *(8 hours)***

- **Topics**: Point estimation; properties of estimators; confidence intervals for means and proportions. Hypothesis testing for means and proportions; p-values; Type I and Type II errors; interpreting results in applied contexts. Hypothesis testing for differences between groups; applications to development economics datasets.
- **Learning outcomes**: Students will compute and interpret point estimates and confidence interval .and will conduct hypothesis tests and interpret their outcomes in the context of economic and social data. Students will be able to compare groups and interpret findings for policy-relevant questions.

**Data Analysis with Excel *(3 hours lecture + 6 hours lab)***

- **Lecture Topics**: Organizing datasets, performing descriptive and bivariate analysis, running basic statistical tests in Excel.
- **Lab Sessions**: Hands-on exercises using real datasets from development economics (e.g., survey data, international statistics).
- **Learning outcomes**: Students will be able to manage datasets and perform basic statistical analyses using Excel.

**Duration:**

27 hours (Theory: 21 hours; Practical sessions: 6 hours)

**Exam:**
The final exam consists of two parts: a written test (80%) and a take-home assignment (20%) to be returned via email. The written exam consists of theoretical questions and exercises to be answered in 60 minutes. It is a closed book exam. Students are not allowed to consult any materials or other sources of information (including notebooks, laptops, dictionaries, mobile phones) during the exam.

**Recommended readings:**
Alan Agresti, Christine Franklin
Statistics: The Art and Science of Learning From Data
Pearson; 3th International Edition
ISBN 9781447964186