

The Hebrew University of Jerusalem

Syllabus

STATISTICS - 96112

Last update 04-08-2021

HU Credits: 6

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: Medicine

Academic year: 0

Semester: 2nd Semester

Teaching Languages: Hebrew

Campus: Ein Karem

Course/Module Coordinator: Dr. Shai Carmi

Coordinator Email: shai.carmi@huji.ac.il

Coordinator Office Hours: by appointment

Teaching Staff:

Prof Shai Carmi,
Dr. Michael Zuckerman,
Mr. roy shimonovich,
Ms. Gal Sasson,
Mr. Yehonada Fachler,
Mr. eliel. klapholz,
Ms. Mittelman Naama

Course/Module description:

The class will cover basic concepts and calculations in statistics and data analysis relevant to medicine and life sciences.

The class is divided into three sections:

1. Descriptive statistics
2. Probability
3. Statistical inference

Course/Module aims:

To teach basic concepts of statistical methods and their application in the biomedical sciences.

Learning outcomes - On successful completion of this module, students should be able to:

- * Describe and summarize data using graphs, tables and summary measures. Identify outliers and their impact.
- * Describe the relationship between two quantitative variables, including calculation of the correlation coefficient and the regression line, and the odds ratio for categorical variables.
- * Solve simple problems in probability, including using conditional probability and Bayes's theorem. Become familiar with basic concepts in diagnostic tests.
- * Model probabilistic problems using random variables, and perform calculations using binomial and normal variables.
- * Understand basic concepts of estimation and hypothesis testing.
- * Compute and interpret confidence intervals for the population mean or proportion.

- * Test hypotheses on the mean or proportion of one population.
- * Test hypotheses on the mean or proportion of two populations.
- * Test hypotheses using non-parametric tests.

Attendance requirements(%):

Teaching arrangement and method of instruction: Lecture and tutorial

Course/Module Content:

- * *Introduction: what is statistics, motivation*
- * *Descriptive statistics: types of variables, the distribution of the data, visualizations, measures of location and spread, percentiles, outliers, survival analysis.*
- * *Relationship between two quantitative variables: linear relation, covariance, the correlation coefficient, correlation vs causation, linear regression, regression goodness of fit.*
- * *Relationship between two qualitative variables: contingency tables, visualizations, the odds ratio.*
- * *Probability: basic concepts, calculation of probabilities in simple problems, basic combinatorics, relationships between events, the inclusion-exclusion principle, conditional probability, the multiplication rule, independence between events, the law of total probability, Bayes' theorem, diagnostic tests.*
- * *Random variables: the distribution of discrete variables, expectation and variance (including of a sum of variables), the binomial variable, the density of continuous variables, the normal distribution, the normal approximation to the binomial distribution.*
- * *An introduction to statistical inference and estimation: properties of samples, the mean and variance of the sample mean, the central limit theorem and the sampling distribution of the sample mean, confidence intervals and their properties, estimating the proportion, estimating the mean with unknown variance, the t distribution.*
- * *Hypothesis testing: basic concepts, testing hypotheses on the mean in one population with known and unknown variance, testing hypotheses on the proportion in one or two populations (the chi-squared test), testing hypotheses on the difference of the means of two populations (paired or independent), non-parametric tests (sign test and Wilcoxon test), inference errors and simple power calculations, the intuition behind hypothesis testing and common pitfalls.*

Some subjects may not be covered in any given year.

Required Reading:

None

Additional Reading Material:

Course/Module evaluation:

End of year written/oral examination 100 %

Presentation 0 %
Participation in Tutorials 0 %
Project work 0 %
Assignments 0 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information:

Homework: problem sets ("exercises") will be posted in the class website (Moodle) approximately every week. The grades on the problem sets will not influence the final grade of the course.

Prerequisites: high school-level mathematics and probability. Please thoroughly review the material before the semester or during the first few weeks.