The Hebrew University of Jerusalem

Syllabus

STATISTICS - 96112

Last update 24-02-2020

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:

Dr. Shai Carmi
Mr. Michael Zuckerman
Mr. Kiderman David
Ms.
Mr.
Mr.
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.*
** Describe the relationship between two quantitative variables, including calculation of the correlation coefficient and the regression line.*
** Solve simple problems in probability, including using conditional probability and Bayes's theorem.*
** Define probabilistic problems using random variables, and perform calculations using binomial and normal variables.*
** Understand and identify basic concepts of estimation and hypotheses testing.*
** Compute and interpret confidence intervals for the population mean or proportion.*

** To test hypotheses on the mean or proportion of one population.*
** To test hypotheses on the mean or proportion of two populations.*
** Compute the probability of making errors in hypothesis testing and compute statistical power.*

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 curves.*
** 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.*
** Random variables: the distribution of discrete variables, expectation and variance, binomial variable, other variables, the distribution 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 means of two populations (paired or independent),non-parametric tests (sign test and Wilcoxon test), types of errors in hypothesis testing, power calculations and experimental design, the intuition behind hypothesis testing and common pitfalls.*

Not all subjects will necessarily be covered in any given year.

Required Reading:
None

Additional Reading Material:

Course/Module evaluation:
End of year written/oral examination 90 %
Presentation 0 %
Participation in Tutorials 0 %

Project work 0 %
Assignments 0 %
Reports 0 %
Research project 0 %
Quizzes 10 %
Other 0 %

Additional information:

Homework: problem sets ("exercises") will be posted in the class website (Moodle) approximately every week. Students will be required to submit final answers online. To pass an exercise, the grade must be over 60. Students must pass at least 80% of the exercises in order to pass the class.

Quizzes: three quizzes will take place during the semester, on the following dates:
1. April 2, 2020
2. May 14, 2020
3. June 18, 2020
All quizzes will be electronic, to be taken from home through the Moodle website. Each quiz will be opened on Thursday at 12:00 and closed on Friday at 12:00. Students are expected to work on the quizzes individually. Dishonest students will be reported to the dean of the faculty, without exceptions.

The total weight of all quizzed in the final grade is 10%.

The final exam will be a multiple choice exam. The weight of the final exam in the final grade will be 90%.

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