האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

Regression and Statistical Models - 52571

Last update 10-03-2023

HU Credits: *6*

Degree/Cycle: *1st degree (Bachelor)*

Responsible Department: *Statistics*

Academic year: *0*

Semester: *2nd Semester*

Teaching Languages: *Hebrew*

Campus: *Mt. Scopus*

Course/Module Coordinator: *Dr. Asaf Weinstein*

Coordinator Email: *asaf.weinstein@mail.huji.ac.il*

Coordinator Office Hours: *Sundays 15:00-16:00*

Teaching Staff:

Dr. Asaf Weinstein,
Ms. Nofar Gabay

Course/Module description:

1. Simple and multiple linear regression

2. Analysis of variance

Course/Module aims:

To build foundations for statistical inference in some basic linear models

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

1. Understand the theory behind the methods studied
2. Apply the methods studied in the lectures
3. Understand analyses that use the methods studied in the lectures

Attendance requirements(%):

None

Teaching arrangement and method of instruction: Chalkboard, with occasional demonstration of computer analysis outputs. In addition, instructor course notes will update during the semester and will be available on the course website

Course/Module Content:

1. Preface
2. Chapters in linear algebra
2.1. Determinant of a matrix
2.2. Diagonalization, eigenvalues and eigenvectors
3. Linear regression in a single explanatory variable. The least squares method
4. Multiple linear regression. Properties of the least squares estimator and geometric interpretation. Projections
5. Probability background. Expectation of a random vector and covariance matrix of a random vector. The multivariate normal distribution
6. Statistical inference in multiple linear regression. Expectation and covariance of the least squares estimator, error variance estimation, the Gauss-Markov theorem, hypothesis testing and confidence interval for a single coefficient an for a linear combination

7. Practical aspects and diagnostics. Residual analysis, multicollinearity, influence metrics
8. Constructing a multiple linear regression model. Initial analysis, dummy variables, interactions, transformations, variable selection, goodness-of-fit measures
9. F-test for comparing two nested models
10. One-way and two-way analysis of variance
11. Random effects models
12. Advanced topics (time permitting): multiple hypothesis testing in linear regression models, post-selection (post-hoc) inference

Required Reading:
Coures notes

Additional Reading Material:
1. Weisberg, S. (1980). Applied Linear Regression
2. Freedman, D. A. (2009). Statistical models: theory and practice
3. Faraway, J. J. (2002). Practical regression and ANOVA using R
4. Ravishanker, N. & Dey, D. K. (2020). A first course in linear model theory
5. Searle, S.R., McCulloch, C.E. & Neuhaus, J.M. (2011).
6. Generalized, linear, and mixed models
7. Scheffe, H. (1999). The analysis of variance

Course/Module evaluation:
End of year written/oral examination 70 %
Presentation 0 %
Participation in Tutorials 0 %
Project work 5 %
Assignments 5 %
Reports 0 %
Research project 0 %
Quizzes 20 %
Other 0 %

Additional information:
Assignments: pass/fail grading. To earn full points in this category you will be required to submit of the homework assignments, where &eq;total # of assignments for the semester. Project work: a project will be assigned in the second part of the semester, replacing two homework assignments