האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

EXPERIMENTAL DESIGN AND ADVANCED STATISTICS FOR RESEARCH STUDENTS - 71138

Last update 27-08-2024

HU Credits: *4*

Degree/Cycle: *2nd degree (Master)*

Responsible Department: *Environmental Economics & Management*

Academic year: *0*

Semester: *1st Semester*

Teaching Languages: *Hebrew*

Campus: *Rehovot*

Course/Module Coordinator: *Dr. Dizza Bursztyn*

Coordinator Email: *Dizza.Bursztyn@mail.huji.ac.il*

Coordinator Office Hours: *Tuesday 13-14*

Teaching Staff:
Dr. Dizza Bursztyn

Course/Module description:
To provide advanced statistical methods that are used for data analysis, in life sciences, using JMP software. The topics are: one-way ANOVA with fixed effects and random effects,test of assumptions, transformations, non-parametric methods two-way analysis of variance and multiple comparisons, three-way analysis of variance, split-plot design, hierarchical models, , mixed models, repeated measures, contingency tables, correlation coefficients, multiple linear regression, analysis of variance with covariates (ANCOVA), survival analysis, principles in design of experiments, sampling methods.

Course/Module aims:
Review of basic statistical methods.
Learning and application of statistical principles in design of experiments.
Use of advanced statistical methods in life science.
Understanding statistical analysis in publications.
Improve the communication with the statistical consultant.
The course will be on applied statistics using JMP.

Learning outcomes - On successful completion of this module, students should be able to:
Statistical tools for design for experiments
Knowledge of advanced statistical tools for data analysis
Test of assumptions required in the statistical analysis
Understanding of the results of statistical analysis in papers
Use of JMP software in statistical analysis

Attendance requirements(%):
100

Teaching arrangement and method of instruction: Lectures, frontal exercise, homework

Course/Module Content:
Review: Descriptive statistics and graphical presentation. Normal distribution. Central limit theorem. Basic sampling. Statistical inference confidence interval and

hypothesis testing). Sample size calculation. Basic principles in design of experiments. Statistical inference for two populations (paired and independent). One-way analysis of variance (ANOVA) and multiple comparisons with fixed effects and random effects. Random blocks. Testing model assumptions. Transformations. Non parametric statistics: Wilcoxon signed-rank test, Mann-Whitney test and Kruskal-Wallis test.
Two way ANOVA, interactions and multiple comparisons. Three way ANOVA. Split plot design. Hierarchical models. Repeated measures. Mixed models.Chi-square test for independence. Spearman and Pearson correlation. Simple linear regression and statistical inference.Testing for model assumptions. Transformations. Multiple linear regression and statistical inference. Dummy variables. Non linear regression, logistic model and ordinal regression. Analysis of covariance (ANCOVA). Survival analysis. Design of experiments: factorial design and optimal design. Sample size determination. Sampling methods (Bootstrap, Jackknife, permutations and Monte-Carlo)

Required Reading:
John Rice. Mathematical statistics and data analysis.
Sokal R. and Rohlf. F.J. Biometry: The Principles and Practices of Statistics in Biological Research
Pagano M., Gauvreau K. Principles of Biostatistics.
Zar. J.H. Biostatistical Analysis

Additional Reading Material:
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Grading Scheme:
Essay / Project / Final Assignment / Home Exam / Referat 80 %
Other 20 %

Additional information:
The students participating in this class must have good knowledge of the content of the course "Statistical principles and experimental design" (71013). An exam will be take place at the beginning of the semester.
Recordings will be available only due to a "justified event" (according to the faculty rules) and only if there is an appropriate equipment in the classroom