

2022-2023

**221.5408 – Statistics with R**  
**Semester B**

**Time:**

**Instructor:** Prof. Eran Tauber, **Email:** etauber@univ.haifa.ac.il

**Office Hours:** Meeting upon request

**Course Level:** (MSc)

**Course Type & Format:** Lecture and Practical sessions

**Number of Hours/Credits:** 3

**Prerequisites:** None.

**Course Overview:**

Over the last two decades the R programming language has emerged as a major tool for data analysis in broad range scientific disciplines. This course will introduce you to the basics of the R language such as handling different data types, techniques for data manipulation, and how to implement fundamental programming tasks. The course is aimed at providing you with practical and powerful tools that to design, execute, analyze, and interpret scientific experiments, while giving you the mathematical and conceptual background to pursue more complex analyses in the future. The lectures will introduce a variety of statistical methods based on Analysis of Variance (ANOVA), as well as the interpretation of statistical and graphic results. The lectures will be accompanied by practical sessions using the R statistical software. Neither knowledge of R, nor programming are required.

**Learning Outcomes – At the end of the course students will be able to:**

1. Understand the of R syntax
2. Conduct common and advanced statistical methods
3. Generate both basic and high-level graphics suitable for scientific publications
4. Perform detailed analysis in R

**Attendance:** Minimum of 80% attendance in lecture is required

**Course Language:** Hebrew, unless overseas students are present, in which case English will be used. Students can always ask questions and get answers in Hebrew. Exams questions are available in both languages.

**Assessment (Assessment Method and Grade Composition):**

Exercises 10%,  
mid-term quiz 20%,  
final exam 70%.

**Week-by-Week Content and Assignments:**

Week #	Topic	Assignment
1	Intro and syntax	
2	Object types (vectors, matrices, arrays, data frames, model objects, lists)	
3	Working with scripts	
4	Writing functions	
5	Data management and pre-processing	
6	Data processing (clearing, subsetting, slicing, reshaping, conversions, shuffling)	
7	Mid-term exam	
8	Summary statistics	
9	Common statistical tests (anova, Z, t, $\chi^2$ , nonparametric tests)	
10	Linear models (simple and multivariate)	
11	Generalized linear models (logistic regression)	
12	Multivariate analyses	
13	Advanced plotting	

**Reading List:**

1. Crawley, Michael J and Crawley, M. J. 2007. The R book. Wiley, Chichester, England ; Hoboken, N.J. Ebook  
(<http://ezproxy.haifa.ac.il/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=197998&site=eds-live&scope=site>)
2. An Introduction to R. 2013. W. N. Venables, D.M. Smith and the R Development Core Team. Version 3.0.1 (2013-05-16). URL: <https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf>