2021-2022

**223.1108 Statistics**

**Semester A**

**Time:** Tuesday, 10:15 – 12:45 , Room 1007 Steps building

**Instructor:** Prof. Uri Hershberg **Email:** uri@sci.haifa.ac.il

**Office Hours:** by appointment

**Teaching Assistants & Class Hours:**

**Yam Amir** yamamir1138@gmail.com Wednesday 8-10 am Room 4043

**Gil Ben David** **gili.bd@gmail.com**Wednesday 8-10 am Room 1022

**Diana Kanaan** **diana.kanaan.1998@gmail.com**Thursday 8-10 am Room 2014

**Course Level:** BA **Course Type & Format:** Lecture

**Number of Hours/Credits: 4 hours / 3 Credits Prerequisites:** None

**Course Overview:** Intro to biostatistics explain basic principles of descriptive statistics and hypothesis testing. An emphasis is made on the importance of using non parametric tests when applicable and the use of statistics beyond hypothesis testing.

**Learning Outcomes:**

1. Students will understand and be able to solve problems in basic probability. (Sampling with and without replacement, permutations and combinations, binomial equation, conditional probability, Bayes' theorem.)
2. Students will be able to construct simple probability models and understand the relationship between those models and hypothesis testing.  (Binomial, hypergeometric, uniform, Poisson and normal distributions)
3. Students will be able to design simple sampling protocols and test basic hypotheses (z-test, t-tests, F-test).
4. Students will be able to analyze experiments with more than two groups using analysis of variance (ANOVA).
5. Students will be able to compare observed data to an experimental model (simple Chi-square tests).
6. Students will be made aware of other statistical techniques, such as linear and logistic regression and nonparametric tests.
7. Students will able to assess under what circumstances each of the statistical tests would be employed, as well as have a solid understanding of the limits of statistical claims, and how to determine if assumptions of a test have been violated (Type I and II error, skewness, kurtosis, F-test for equal variances, identifying bias, etc.)

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

Class participation 5%

Completion of 10 (of 12) at home ungraded exercises 10%

Top grades of 2 of 3 graded exercises (students must complete all 3) 50%

Final test 35%

Bonus project - identification and class presentation (lecture and short paper) of published scientific research with statistical error 20% bonus

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

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| **Week #** | **Topic** | **Assignment**  |
| 1 | Why statistics ? | At home exercise |
| 2 | Descriptive Statistics | At home exercise |
| 3 | Probability | At home exercise + graded exercise |
| 4 | The Normal distribution | At home exercise |
| 5 | Hypothesis testing  | At home exercise |
| 6 | Singel sample t t-test | At home exercise |
| 7 | Multple sample testing  | At home exercise |
| 8 | Non parametric tests | At home exercise + graded exercise |
| 9 | Goodness of fit testing | At home exercise |
| 10 | Correlation  | At home exercise |
| 11 | ANOVA | At home exercise + graded exercise |
| 12 | Summary lecture  | At home exercise |

**Website:** <https://mw11.haifa.ac.il/course/view.php?id=3091>

**Reading List:**

1. Zar, Jerrold H. (2010). Biostatistical Analysis (5th Edition), Prentice-Hall  ISBN: 0131008463
2. Diez, David and Cetinkaya-Rundel, Mine (2015) Open Intro Statistics 3rd Edition <https://www.openintro.org/book/os/>
3. David Spiegelhalter (2019) The Art of Statistics, Pelican Books ISBN: 0241398630