

Biostatistics Class Outline Bio 710

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Office hours: Wed. 10:30am-12:30 pm, and Thurs 9:00-11:00am

Course objectives:

Students will learn a wide range of statistical tool and concepts that are particularly useful to biologists. Topics include descriptive statistics, types of data, comparisons of two populations, probability, multiple comparisons (ANOVA), experimental design, goodness of fit, linear regression, power analysis, and multivariate analysis. Students will become proficient using R, one of the major statistical programs available. Students will be encouraged to apply these techniques to their own research projects.

Course Assessment

Grades will be based on:

weekly problem assignments- (40 points total)

notebook -20 points

mid-term -20 points

final -20 points

Total: -100 points

Text: Biostatistical Analysis by Jerrold Zar. –any fairly recent edition will work (3rd and above)

Week Topics

1. Introduction, Using R, types of data, types of distributions, the experimental process, the null hypothesis
2. Measures of the central tendency, measuring variation (range, standard deviation, variance), confidence intervals.
3. Probability, more on normal distribution (tests for normality), transformations, parametric vs non parametric tests
4. One-sample hypotheses (one and two tail tests, confidence limits, two-sample hypotheses (t-test, variance ratio test, Welch's approx. t, Man-Whitney U test), Power analysis and sample size

5. Paired samples (paired t-test, Wilcoxon signed rank test), ANOVA (one-way), Kruskal-Wallis Test
6. multiple comparisons (Tukey test, Newman-Keuls test, planned comparisons, non-parametric multiple comparisons)
7. ANOVA (two-way), Randomized block design, Repeated -measures analysis, Analysis of covariance.
8. Mid-term exam.
9. Multiway factorial analysis of variance, factor analysis, Nested analysis of variance.
10. Multivariate analysis of variance, simple linear regression
11. Comparing linear regressions, linear correlation
12. Multiple logistic regression, nonlinear regressions
13. Multivariate ordination
14. Final exam