Experimental Design and Quantitative Tools for Biologists
(JNL 208 credits 2:0:0)
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1. **Introduction to Biostatistics :**
   a. History of the field of statistical analyses
   b. Types of data
   c. How to represent data - types of graphs,
   d. Tips for sampling and how to avoid sampling bias
   e. Frequency distributions.

2. **Description of data and uncertainty:**
   a. Variation
   b. Measures of central tendency: mean, median, mode,
   c. Measures of spread: standard deviation, standard error of the mean, interquartile range,
   d. Proportions, confidence intervals, types of errors.

3. **Hypothesis Testing:**
   a. Introduction to probability theory, the probability distribution, conditional probability and Bayes' theorem,
   b. The null hypothesis – setting up null and alternative hypotheses
   c. *p*-value, binomial distribution,
   d. Student's *t*-test, One- and Two-Way Analysis of Variance, Mann-Whitney U test, Wilcoxon Signed-Rank Test, Kruskal-Wallis test,
   e. Post-hoc tests: Tukey, Bonferroni, Dunnet.
   f. Analysis of categorical data: Chi-Square tests, Fisher's exact test.

4. **Correlation and Regression:** Linear correlation coefficient, Spearman's Rank Correlation, testing correlation, linear regression, Coefficient of determination.

5. **Basics of Experimental Design:** Confounding variables, artifacts, controls, blinding, replication, power analysis.

References / Textbooks : Analysis of Biological Data by Michael Whitlock and Dolph Schluter, Biostatistical Analysis by Jerrold Zar. Statistics for terrified biologists by Helmut van Emden