

**Course Structure for**  
**Biostatistics & Bio-mathematics**

**I. Theory Component:**

- 1. Introduction to Biostatistics:** History of statistics, types of data, data representation, types of graphs, sampling, biases, frequency distributions.
- 2. Description of data and uncertainty:** Measures of central tendency and measures of spread: mean, median, mode, standard deviation, standard error, interquartile range, proportions, confidence intervals, types of errors.
- 3. Hypothesis Testing:** Basics of probability theory, the probability distribution, conditional probability and Bayes' theorem, the null hypothesis, the p-value, binomial distribution, Student's t-test, Analysis of Variance, post-hoc tests: Tukey, Bonferroni, Dunnett. Analysis of categorical data: Chi-Square tests, Fisher's exact test.
- 4. Correlation and Regression:** Linear correlation coefficient, testing correlation, linear regression, regression towards the mean,  $R^2$  values.
- 5. Basics of Experimental Design:** Confounding variables, artifacts, controls, blinding, replication.

**II. Practical Component:**

Using statistical tools on Microsoft Excel and GraphPad Prism for each module described in the theory classes.

**III. Recommended Books:** Analysis of Biological Data by Michael Whitlock and Dolph Schluter, Biostatistical Analysis by Jerrold Zar.