



Institute of Botany
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline
Semester – V



Programme	BS Botany	Course Code	Bot-311	Credit Hours	2
Course Title	Biostatistics (Theory)				
Introduction					
The course will provide knowledge about the importance and use of statistics in life sciences. It will help the students to understand the methods to analyze data pertaining to their research work and to assess the significance of their experimental designs.					
Learning Outcomes					
After completing this course, the student will: <ul style="list-style-type: none"> • gain knowledge about the importance and use of statistics in life sciences. • understand the methods to analyze data pertaining to their research work and to assess the significance of their experimental designs. • apply basic statistical procedures for analysis of data for practical and research. 					
Course Contents					
Introduction objectives and scope: <ul style="list-style-type: none"> • Definition • Characteristics • Importance and limitations • Population and samples 					
Frequency distribution: <ul style="list-style-type: none"> • Variable types • Formation of frequency table from raw data • Summation, notation and statistical inference • Data transformation. 					
Measures of central tendencies and dispersion: <ul style="list-style-type: none"> • Arithmetic mean • Median • Mode • Range • Variance • Standard deviation • Standard error of the mean • Mean deviation. 					
Organizing and describing data (Standard distributions): <ul style="list-style-type: none"> • Random sampling and the binomial distribution • Probability, Types of Probabilities, Random variables, Combining probabilities, Probability distributions, Binomial distributions. • Poisson and normal distributions, properties and applications. 					
Basic experimental design:					

- Concept and design
- Principles of experiments
- Observational studies
- Planning of experiments
- Replication and randomization
- Field plot technique
- Layout and analysis of completely randomized design
- Randomized complete block design
- Latin square
- Factorial design
- Treatment comparison

Tests of significance:

- T-test: (Basic idea, confidence limits of means, significant difference of means).
- Chi square test: Basic idea, testing goodness of fit to a ratio, testing association (contingency table).
- F-test: Introduction and application in analysis of variance.
- LSD test, Duncan's New Multiple Range test (for comparison of individual means). Bonferroni test.

Introduction to comparing of means:

- Unit organization, Basic one-way ANOVA, Types of sums of squares, How ANOVA works, The ANOVA Table. Two-way ANOVA-Factorial designs: (two-way factorial analysis, calculating and analyzing the two-way ANOVA, Linear combination, multiple comparisons. Correlation and Regression.

Programme	BS Botany	Course Code	Bot-312	Credit Hours	2
Course Title	Biostatistics (Lab)				
Lab Course Contents					
<ul style="list-style-type: none"> • Data collection, arrangement of data in frequency table, calculating frequency, cumulative frequency and preparation of Ogive. • Calculating different measure of central tendency such as arithmetic means, harmonic mean, geometric mean, median and mode. • Calculation of variance and standard deviation from grouped and ungrouped data. • Calculating dispersion, relative dispersion, standard deviation, standard error, standard score and co-efficient variation by hand and machine method. • Problems concerning probability, binomial distribution, T-test Chi square test. • Analysis of variance - one factor design. • Multiple Analyses of Variance. • Determination of correlation by constructing different types of graphs such as scatter diagram, linear positive correlation, linear perfect negative correlation, no correlation and curvilinear correlation (second degree polynomial, third degree polynomial). • Linear Regression and multiple regression models. • MS Excel, MSTAT or relevant statistical software packages. • Calculation of mean from grouped and ungrouped data. 					
Textbooks and Reading Material					
<ol style="list-style-type: none"> 1. Campbell, R. C. (1989). Statistics for Biologists. Cambridge University Press. 2. Forthofer, R. N., Lee E. S., Hernandez, M. (2011). Biostatistics: A Guideto Design, Analysis and Discovery 2nd Ed. Elsevier Inc. 3. Norman G.R., Streiner, D.L. (2000). Biostatistics: The Bare Essentials. B.C. Decke Inc. 4. Quinn, G., P., Keough M. J.(2002). Experimental Design and Data Analysis for Biologists. Cambridge University Press. 5. Rao, K.V. (2009). Biostatistics: A Manual of Statistical Methods for Use in Health, Nutrition and Anthropology. Jaypee Brothers Publishers. 6. Samuels, M. L. and Witmar, J. A. (2003). Statistics for life sciences. 3rd Edition. Cambridge University Press. 					

7. Triola, M. F. and Triola, M. M. (2005). Biostatistics for Biological and Health Sciences. Pearson Addison Wesley.
8. Zar, J. H. (2013). Biostatistical analysis, 4thEd. Dorling Kindersley Publ. Inc

Teaching Learning Strategies

- Lectures
- Group Discussion
- Laboratory work
- Seminar/ Workshop

Assignments: Types and Number with Calendar

- Lecture Based Examination (Objective and Subjective)
- Assignments
- Class discussion
- Quiz
- Tests
