Course title: Statistics for Life Science-1

Course code: UBT 201	**No. of credits:** 2	**L-T-P:** 19-11-00	**Learning hours:** 30

Pre-requisite course code and title (if any): None

Department: Department of Biotechnology

Course coordinator: Dr. Yogendra Kumar Gautam	**Course instructor:** Dr. Yogendra Kumar Gautam

Contact details:

Course type: Major	**Course offered in:** Semester 3

Course description: This course introduces fundamental concepts of biostatistics, including descriptive statistics, probability distributions, random variables, and mathematical expectation. It covers statistical methods such as correlation, regression analysis, and hypothesis testing using the t-test, chi-square test, and F-test. Students will also gain practical exposure to modern statistical software, such as MS Excel and SPSS, for data analysis and biostatistical applications.

Course objectives:

To train students in using computational and mathematical tools to solve biological problems. After completing this course, students will be able to understand descriptive and inferential statistical tests for interpreting experimental data.

Course contents

Module	**Topic**	**L**	**T**	**P**
1	Descriptive Statistics & Probability: Measures of central tendency and dispersion, Axiomatic concepts of probability; Introduction to Binomial, Poisson, and Normal distribution.	**6**	**2**	**0**
2	Random variables and expectation: Random variable and distribution function. Mathematical expectation. Statistical parameters. Chebyshev's inequality.	**4**	**3**	**0**
3	Correlation, and regression: Correlation - types and methods of correlation, Regression- simple regression equation, Method of least squares and curve fitting, similarities and dissimilarities of correlation and regression. (Illustrated with appropriate case studies).	**4**	**3**	**0**
4	Statistical inference and hypothesis testing. Selection of appropriate probability distribution for different contexts. Student's t-test - chi-square test, F-test. Uses of advanced software:- MS Excel and SPSS, in modern biostatistics. (Illustrated with appropriate case studies).	**5**	**3**	**0**
	Total	**19**	**11**	**0**

Evaluation criteria:

Minor exam: 30%
Major exam:50%
PPT/Assigenment:20%

Learning outcomes:

1. Describe the fundamental concepts of Biostatistics as they apply to biotechnology research
2. Capacity to compare and evaluate various approaches in solving a given experimental problem.

Pedagogical Approach:

1. Interactive lectures
2. Biological analogies
3. Case studies and examples from research articles

Skill Set:

1. Hypothesis formulation and testing in Biostatistics.
2. Ability to analyze primary and secondary experimental data.

Employability:

1. School assistant teacher
2. Laboratory assistant
3. Junior researcher
4. Statistician in the private and government sectors

Suggested Readings

1. Principles of Biostatistics by Pagano, M. and Gaureau, K. 7th ed., Publisher: Thomson Learning, (2007).
2. Statistical Method for Engineering and Sciences by Taneja, H.C. Publisher: IK International, (2009).
3. Introduction to Biostatistics, L Forthofer (1995), Academic Press, New York.
4. Probability and Statistics for Engineers and Scientists by Ross, S.M. 3rd ed. Publisher: Academic Press, (2005).
5. Experimental Design & Data Analysis for Biologists. PQ Gerry & JK Michael (2002), Cambridge University Press.

Additional information (if any):

Student responsibilities:

1. Class attendance.
2. Study/self-study of course materials as specified by the instructor.

Course reviewers:

1. Dr. Jai Gopal Sharma, Professor, Department of Biotechnology, Delhi Technical University, New Delhi
2. Dr. Gaurav Kumar, Associate Professor, Delhi University, New Delhi