

Branch Name:	Bachelor of Pharmacy
Program Code:	PH101
Course Name:	Applied Biostatistics and Data Analytics for Pharmaceutical Sciences (Theory)
Course Code:	1BP201T

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)		
Lecture	Tutorial	Practical	Credit	Theory (T)		Total Marks
				Continuous Assessment	University Assessment	Theory
2	-	NA	2	20	30	50

Course Objectives:

The objectives of this course are to:

1. Explain fundamental statistical concepts relevant to pharmaceutical sciences.
2. Develop the ability to interpret clinical and experimental data scientifically.
3. Apply statistical methods for analysing pharmaceutical and biomedical data.
4. Demonstrate the use of Python-based tools for statistical analysis and data handling.
5. Recognize the role of statistical analysis in evidence-based decision making and machine learning applications in healthcare.

Course Outcomes (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Classify pharmaceutical data using appropriate descriptive statistics.
2	Apply probability concepts and statistical distributions in clinical and pharmaceutical contexts.
3	Perform sampling and hypothesis testing for decision-making in research.
4	Analyze correlation and regression relationships in pharmaceutical datasets.
5	Demonstrate statistical analysis using Python and interpret outputs appropriately.

Subject Contents:

Unit. No.	Topic	Total Hours (30 hours)	Weight (%)
1	Descriptive Statistics - Types of data in pharmaceutical sciences (nominal, ordinal, interval, ratio) - Sources of data in pharmacy: clinical trials, pharmacovigilance, quality control, PK studies - Measures of central tendency: mean, median, mode, their calculation and interpretation - Measures of dispersion (range, variance, standard deviation) and their interpretation using pharmaceutical data - Skewness and understanding distribution shape in biological measurements	6	20

	Perform descriptive statistical analysis using Python libraries such as NumPy and Pandas, with focus on Interpretation of results		
2	Probability & Statistical Distributions in Healthcare - Basic probability concepts and laws (addition and multiplication rules), conditional probability and its interpretation - Bayes' theorem and its application in clinical decision-making - Concept of random variables (discrete and continuous) - Normal distribution and its importance in biological and pharmaceutical measurements, - Binomial distribution demonstrating applications in clinical trial outcomes - Poisson distribution for modeling rare events such as adverse drug reactions - Graphical visualization of these probability distributions using Python	6	20
3	Sampling & Statistical Inference - Population versus sample, sampling techniques used in clinical research, Sampling error and bias - Conceptual understanding of the Central Limit Theorem - Confidence intervals and their interpretation - Hypothesis testing framework (null and alternative hypotheses) - Type I and Type II errors, p-value and statistical significance - Demonstration, calculation and interpretation of these parameters using python with pharmaceutical data	6	20
4	Basics of Correlation & Regression Conceptual understanding of the following concepts with emphasis on their interpretation- - correlation and Pearson correlation coefficients - Interpretation of positive and negative correlations - Scatter plots and trend visualization using pharmaceutical data such as dose-response relationships - Simple linear regression concept, interpretation of regression coefficients - Introduction to odds ratio and its application in clinical risk analysis	6	20
5	Statistical Analysis Using Python – Case based learning - Demonstration of descriptive statistics, correlation analysis and linear regression using Python libraries- SciPy / Statsmodels / Scikit-learn on pharmaceutical datasets - Interpretation of the output summaries and p-values - Preparation of statistical reports	6	20

References:

1. Lane, D.M., Introduction to Statistics. Houston: Rice University. Available at: <https://onlinestatbook.com/2/index.html>
2. Walters, S.J., Campbell, M.J. and Machin, D., Medical Statistics: A Textbook for the Health Sciences. Hoboken, NJ: Wiley-Blackwell.
3. Rowe, P., Essential Statistics for the Pharmaceutical Sciences. London: Pharmaceutical Press.
4. Bolton, S. and Bon, C., Pharmaceutical Statistics: Practical and Clinical Applications. New York: Informa Healthcare.
5. De Muth, J.E., Basic Statistics and Pharmaceutical Statistical Applications. Boca Raton, FL: CRC Press.

List of Open Source Software/learning website:

1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma139: Probability & Statistical Distributions in Healthcare
2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma110 : Basics of Correlation & Regression