Subject name with code: **13PH0801 Biostatistics and Research Methodology**

**Course Objective**
To understand the applications of Biostatistics in Pharmacy. This subject deals with descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, non-Parametric tests, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies, SPSS, R and MINITAB statistical software’s, analyzing the statistical data using Excel.

**Course Outcomes**
Upon completion of the course, the student shall be able to
1. Know the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment).
2. Know the various statistical techniques to solve statistical problems.
3. Appreciate statistical techniques in solving the problems.

**Teaching and assessment scheme**

<table>
<thead>
<tr>
<th>Teaching Scheme (Hours)</th>
<th>Credits</th>
<th>Theory/ Tutorial Marks</th>
<th>Practical Marks</th>
<th>Total Marks</th>
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<tr>
<td>Theory</td>
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<tr>
<td>Tutorial</td>
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<td>15</td>
<td>75</td>
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<td>Practical</td>
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<tr>
<td>Total</td>
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<td>10</td>
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**Theory syllabus**

**Unit-1**

**Unit-2**
Regression: Curve fitting by the method of least squares, fitting the lines \( y = a + bx \) and \( x = a + by \), Multiple regression, standard error of regression - Pharmaceutical Examples. Probability: Definition of probability, Binomial distribution, Normal distribution Poisson’s distribution, properties - problems Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, the essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of the mean (SEM) - Pharmaceutical examples. Parametric test: t-test (Sample, Pooled or Unpaired and Paired), ANOVA, (One way and Two way), Least Significance difference.

**Unit-3**
Non-parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test. Introduction to Research: Need for research, Need for the design of Experiments, Experiential Design Technique, plagiarism. Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph. Designing the methodology: Sample size determination and power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

**Unit-4**

**Unit-5**
Design and analysis of experiments: Factorial Design: Definition, \( 2^2 \), \( 2^3 \) design. Advantage of factorial design. Response Surface methodology: Central composite design, Historical design, Optimization Techniques.

Tutorials will be based on the above syllabus.

**Recommended references (Latest edition)**