INSTITUTE	**FACULTY OF PHARMACY**
PROGRAM	**BACHELOR OF PHARMACY**
SEMESTER	**8**
COURSE TITLE	**BIOSTATISTICS AND RESEARCH METHODOLOGY**
COURSE CODE	**13PH0801**
COURSE CREDITS	**4**

Objective:

1 To understand the applications of Biostatics 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.

2 To understand the applications of Biostatics 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: After completion of this course, student will 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.

Pre-requisite of course: 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.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	1	0	75	15	10	0	0

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Contents : Unit	Topics	Contact Hours
1	**Introduction: Statistics, Biostatistics, Frequency distribution.** Introduction: Statistics, Biostatistics, Frequency distribution. Measures of central tendency: Mean, Median, Mode Pharmaceutical examples. Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical Problems. Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlations - Pharmaceuticals examples.	10
2	**Regression** 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.	10
3	**Non-parametric tests:** 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.	10
4	**Blocking and confounding system:** Blocking and confounding system: for two-level factorials. Regression modelling: Hypothesis testing in Simple and Multiple regression models. Introduction to Practical components of Industrial and Clinical Trials Problems: Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R - Online Statistical Software to Industrial and Clinical trial approach.	8
5	**Design and analysis of experiments:** 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.	7
Total Hours		**45**

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Tutorials** Tutorial 1, Tutorial 2, Tutorial 3, Tutorial 4, Tutorial 5, Tutorial 6, Tutorial 7, Tutorial 8, Tutorial 9, Tutorial 10, Tutorial 11, Tutorial 12, Tutorial 13, Tutorial 14, Tutorial 15	15
Total Hours		**15**

Textbook :

1 Pharmaceutical statistics - Practical and clinical applications,, Sanford Bolton,, publisher Marcel Dekker Inc. New York., 1997

References:

1 Fundamental of Statistics - Himalaya Publishing House- S. C. Gupta.

2 Design and Analysis of Experiments - PHI Learning Private Limited, R. Pannerselvam.

3 Design and Analysis of Experiments - Wiley Students Edition, Douglas and C. Montgomery.

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
20.00	25.00	25.00	15.00	15.00	0.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and the need of students. The teacher in addition to the conventional teaching method by the blackboard may also use any tools such as demonstration, role play, quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done based on continuous evaluation of students in the laboratory and classroom.

3 Students will use supplementary resources such as online videos, NPTEL videos, MOOCs/ e-courses, virtual laboratories.

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