SUBJECT – STATISTICS (B.Sc.)
:: Programme Outcomes (POs) ::

Students having Degree in B.Sc. (with Statistics) should have knowledge of different concepts and fundamentals of Statistics and ability to apply this knowledge in various fields of industry. They may pursue their future career in the field of Statistics and Research.

:: Programme Specific Outcomes (PSOs)::

After completing B.Sc. (with Statistics) the student should have

➢ Knowledge of different concepts, principles, methodologies and tools (skills) of Statistics.

➢ Ability to collect, tabulate, represent graphically, analyze and interpret data/information by using appropriate statistical tools.

➢ Ability to identify and solve a wide range of problems in real life/industry related to Statistics.

➢ Familiarity with computational techniques and statistical software including programming language (e.g. R) for mathematical and statistical computation.

➢ Capability to use appropriate statistical skills in interdisciplinary areas such as finance, health, agriculture, government, business, industry, telecommunication and bio-statistics.

➢ Ability to compete with industrial/private sector demand in the field of data analysis, marketing survey, etc. in professional manner and pursue their future career in the field of Statistics.

➢ Ability to develop original thinking for formulating new problems and providing their solutions. As a result, they will be able to pursue higher studies or research in the field of Statistics.

Programme/Class: **Certificate**	Year: **First**	Semester: **First**
Subject: **STATISTICS**		
Course Code: -**B060101T**	Course Title: **Descriptive Statistics (Univariate) and Theory of Probability**	

Course outcomes:

After completing this course a student will have:

✓ Knowledge of Statistics, its scope and importance in various fields.

✓ Ability to understand concepts of sample vs. population and difference between different types of data.

✓ Knowledge of methods for summarising data sets, including common graphical tools (such as boxplots, histograms and stemplots). Interpret histograms and boxplots.

✓ Ability to describe data with measures of central tendency and measures of dispersion.

✓ Ability to understand measures of skewness and kurtosis and their utility and significance.

✓ Ability to understand the concept of probability along with basic laws and axioms of probability.

✓ Ability to understand the terms mutually exclusive and independence and their relevance.

✓ Ability to identify the appropriate method (i.e. union, intersection, conditional, etc.) for solving a problem.

✓ Ability to apply basic probability principles to solve real life problems.

✓ Ability to understand the concept of random variable (discrete and continuous), concept of probability distribution.

Programme/Class: **Certificate**	Year: **First**	Semester: **First**
Subject: **STATISTICS**		
Course Code: -**B060102P**	Course Title: **Descriptive Data Analysis Lab (Univariate)**	

Course outcomes:

After completing this course a student will have:

✓ Ability to represent/summarise the data/information using appropriate Graphical methods including common graphical tools (such as boxplots, histograms and stemplots) and also to draw inferences from these graphs

✓ Acquire the knowledge to identify the situation to apply appropriate measure of central tendency as per the nature and need of the data and draw meaningful conclusions regarding behavior of the data.

✓ Acquire the knowledge to identify the situation to apply appropriate measure of dispersion as per the nature and need of the data and draw meaningful conclusions regarding heterogeneity of the data.

✓ Ability to measure skewness and kurtosis of data and define their significance.

✓ Acquire the knowledge to compute conditional probabilities based on Bayes Theorem.

Programme/Class: **Certificate**	Year: **First**	Semester: **Second**
Subject: **STATISTICS**		
Course Code: -**B060201T**	Course Title: **Descriptive Statistics (Bivariate) and Probabiity Distributions**	

Course outcomes:

After completing this course a student will have:

✓ Knowledge of the method of least squares for curve fitting to theoretically describe experimental data with a function or equation and to find the parameters associated with the model.

✓ Knowledge of the concepts of correlation and simple linear regression and Perform correlation and regression analysis.

✓ Ability to interpret results from correlation and regression.

✓ Ability to compute and interpret rank correlation. .

✓ Ability to understand concept of qualitative data and its analysis.

✓ Knowledge of discrete distributions. Discuss appropriate distribution negative binomial, Poisson, etc. with their properties and application of discrete distribution models to solve problems.

✓ Knowledge of continuous distributions. Discuss the appropriate distribution (i.e. uniform, exponential, normal, etc.) with their properties and application of continuous distribution models to solve problems.

✓ Knowledge of the formal definition of order statistics, derive the distribution function and probability density function of the rth order statistic and joint distribution of rth and s^{th} order statistics.

✓ Ability to identify the application of theory of order statistics in real life problems.

Programme/Class: **Certificate**	Year: **First**	Semester: **Second**
Subject: **STATISTICS**		
Course Code: -**B060202P**	Course Title: **Descriptive Data Analysis Lab (Bivariate)**	

Course outcomes:

After completing this course a student will have:

1. Ability to deal with the problems based on fitting of curves by Method of least squares e.g. fitting of straight line, second degree polynomial, power curve, exponential curve etc.
2. Ability to deal with problems based on determination of Regression lines and calculation of Correlation coefficient – grouped and ungrouped data.
3. Ability to deal with the problems based on determination of Rank correlation.
4. Ability to fit binomial and poisson distribution for given data..

Programme/Class: **Diploma**	Year: **Second**	Semester: **Third**

Subject: **STATISTICS**		
Course Code: -**B060301T**	Course Title: **Theory of Estimation and Sampling Survey**	

Course outcomes:

After completing this course a student will have:
- ✓ Knowledge of the concept of Sampling distributions.
- ✓ Ability to understand the difference between parameter & statistic and standard error & standard deviation.
- ✓ Knowledge of the sampling distribution of the sum and mean.
- ✓ Ability to understand the t, f and chi-square distribution and to identify the main characteristics of these distributions.
- ✓ Knowledge of the concept of Point and Interval Estimation and discuss characteristics of a good estimator.
- ✓ Ability to understand and practice various methods of estimations of parameters.
- ✓ Ability to understand the concept of sampling and how it is different from complete enumeration.
- ✓ Knowledge of various probability and non-probability sampling methods along with estimates of population parameters
- ✓ Ability to identify the situations where the various sampling techniques shall be used.
- ✓ Knowledge of sampling and non-sampling errors.
- ✓ Knowledge of regression and ratio methods of estimation in simple random sampling (SRS).

Programme/Class: **Diploma**	Year: **Second**	Semester: **Third**

Subject: **STATISTICS**		
Course Code: -**B060302P**	Course Title: **Sampling Techniques Lab**	

Course outcomes:

After completing this course a student will have:
1. Ability to draw a simple random sample with the help of table of random numbers.
2. Ability to estimate population means and variance in simple random sampling.
3. Ability to deal with problems based on Stratified random sampling for population means (proportional and optimum allocation).
4. Ability to deal with problems based on Systematic random sampling
5. Ability to deal with problems based on two stage sampling
6. Ability to deal with problems based on Ratio and regression estimation of population mean and total.

Programme/Class: **Diploma**	Year: **Second**	Semester: **Fourth**

Subject: **STATISTICS**		
Course Code: -**B060401T**	Course Title: **Testing of Hypothesis and Applied Statistics**	

Course outcomes:

After completing this course a student will have:
- ✓ Knowledge of the terms like null and alternative hypotheses, two-tailed and one- tailed alternative hypotheses, significant and insignificant, level of significance and confidence, p value etc.
- ✓ Ability to understand the concept of MP, UMP and UMPU tests
- ✓ Ability to understand under what situations one would conduct the small sample and large sample tests (in case of one sample and two sample tests).
- ✓ Familiarity with different aspects of Applied Statistics and their use in real life situations.
- ✓ Ability to understand the concept of Time series along with its different components.
- ✓ Knowledge of Index numbers and their applications along with different types of Index numbers.
- ✓ Familiarity with various demographic methods and different measures of mortality and fertility.
- ✓ Ability to understand the concept of life table and its construction.
- ✓ Knowledge to understand the concept of statistical quality control and different control charts for variables and attributes.

Programme/Class: **Diploma**	Year: **Second**	Semester: **Fourth**

Subject: **STATISTICS**		
Course Code: -**B060402P**	Course Title: **Tests of Significance and Applied Statistics Lab**	

Course outcomes:

After completing this course a student will have:
1. Ability to conduct test of significance based on t – test and Chi-square test.
2. Knowledge about Fisher's Z-transformation and its use in testing
3. Ability to deal with problems based on large sample tests.
4. Ability to deal with problems based on time series and calculation of its different components for forecasting.
5. Ability to deal with problems based on Index number.
6. Acquire knowledge about measurement of mortality and fertility.
7. Ability to deal with problems based on life table.
8. Ability to work with control charts for variables and attributes and draw inferences.

Programme/Class: **B.Sc.**	Year: **Third**	Semester: **Fifth**

Subject: **STATISTICS**		
Course Code:-**B060501T**	Course Title: **Multivariate Analysis and Non-parametric Methods**	

Course outcomes:

After completing this course a student will have:
- ✓ Ability to understand the basic concepts of vector space and matrices in order to study multivariate distribution.
- ✓ Knowledge of the applications of multivariate normal distribution and Maximum Likelihood estimates of mean vector and dispersion matrix.
- ✓ Knowledge of Principal Component Analysis and Factor Analysis.
- ✓ Ability to apply distribution free tests (Non-parametric methods) for one and two sample cases.

Programme/Class: **B.Sc.**	Year: **Third**	Semester: **Fifth**

Subject: **STATISTICS**		
Course Code: -**B060502T**	Course Title: **Analysis of Variance and Design of Experiment**	

Course outcomes:

After completing this course a student will have:
- ✓ Knowledge of the concept of Analysis of Variance (ANOVA).
- ✓ Ability to carry out the ANOVA for One way and Two way Classification.
- ✓ Ability to carry out the post-hoc analysis.
- ✓ Knowledge of the concept of Design of experiment and its basic principles.
- ✓ Ability to perform the basic symmetric designs CRD, RBD and LSD with and without missing observations.
- ✓ Knowledge of the concept of factorial experiments and their practical applications.

Programme/Class: **B.Sc.**	Year: **Third**	Semester: **Fifth**

Subject: **STATISTICS**		
Course Code: -**B060503P**	Course Title: **Non-parametric Methods and DOE Lab**	

Course outcomes:

After completing this course a student will have:
1. Ability to conduct test of significance based non-parametric tests.
2. Ability to deal with multivariate data.
3. Knowledge of Principal Component Analysis and Factor Analysis. Ability to perform ANOVA for one way and two classification.
4. Ability to perform post-hoc analysis.
5. Ability to conduct analysis of CRD, RBD and LSD with and without missing observations.
6. Ability to conduct analysis for Factorial experiments (without confounding).

Programme/Class: **B.Sc.**	Year: **Third**	Semester: **Sixth**
Subject: **STATISTICS**		
Course Code: -**B060601T**	Course Title: **Statistical Computing and Introduction to Statistical Software**	

Course outcomes:

After completing this course a student will have:
- ✓ Basic Knowledge of SPSS and R programming with some basic notions for developing their own simple programs and visualizing graphics in R.
- ✓ Ability to perform data analysis for both univariate and multivariate data sets using R as well as SPSS

Programme/Class: **B.Sc.**	Year: **Third**	Semester: **Sixth**
Subject: **STATISTICS**		
Course Code: -**B060602T**	Course Title: **Operations Research**	

Course outcomes:

After completing this course a student will have:
- ✓ An idea about the historical background and need of Operations research.
- ✓ Ability to identify and develop operational research models from the verbal description of the real life problems.
- ✓ Knowledge of the mathematical tools that are needed to solve optimization problems.
- ✓ Ability of solving Linear programming problem, Transportation and Assignment problems, Replacement problems, Job sequencing, etc.
- ✓ Ability to solve the problems based on Game Theory.

Programme/Class: **B.Sc.**	Year: **Third**	Semester: **Sixth**
Subject: **STATISTICS**		
Course Code: -**B060603P**	Course Title: **Operations Research and Statistical Computing Lab**	

Course outcomes:

After completing this course a student will have:
1. Knowledge of mathematical formulation of L.P.P
2. Ability of solving LPP using different methods.
3. Ability to solve Allocation Problem based on Transportation and .Assignment model.
4. Ability to solve problems based on Game Theory.
5. Ability to use programming language R as Calculator.
6. Knowledge of using R in simple data analysis.
7. Able to perform statistical analysis by using SPSS.