Program Name: B. Sc. Statistics

Program specific Outcomes

A student completing this program will be able to:

PSO1 Demonstrate the ability to apply fundamental concepts of Descriptive Statistics (Exploratory Data Analysis).

PSO2 Apply the basic ideas of probability, random variables, mathematical expectation and probability distributions in real life studies and sustainability values

PSO3 Reflect the skill of designing sample survey, finding sampling distributions of statistics to address ethical and social issues

PSO4 Able to choose suitable sampling method to draw samples from the populations under study.

PSO5 Apply the foundations of classical inference involving point estimation, forming confidence interval and hypothesis testing.

PSO6 Demonstrate the skills of applied statistics such as correlation-regression, analysis of variance, design of experiments, demographics methods, statistical quality control and economic statistics

PSO7 Apply the techniques of Operations Research and various analytical methods

PSO8 Apply the classical methods of 'Real and Complex Analysis' in the development of mathematical and statistical models.

PSO9 Expertise in using statistical software – R programming, SPSS and Excel to meet the challenges of research and development

PSO10 Able to get job employment in academia, civil services, defence services, government and private organizations in India and abroad.

Course outcomes for all courses offered by the department:

Semester	Course code	Course name	Course Outcomes Student completing this course is able to
1	ST-1501	Descriptive Statistics and Probability Theory	1: Identify the sources of data emission, record the data meaningfully, perform Exploratory Data Analysis and draw useful conclusions. 2: Compute suitable measures of averages, dispersion and higher order moments from sample/population data. 3: Demonstrate the skill of identifying/designing the random experiments and their sample spaces. Apply ideas of probability theory,

			conditional probability, Bayes' theorem in real life situations. 4: Apply the idea of random variables and their expected values to study the behaviour of random phenomenon occurring in business, industry and daily life activities.
1	ST-1502L	Statistics Practical	1: Demonstrate the skill of preparing classification and tabulation of data. 2: Reflect the skill of presenting data by diagrams, graphs and charts using MSExcel and manually both. 3: Compute the measures of averages, dispersion and higher order moments from sample/population data, using MS-Excel and manually both. 4: Perform a small case study on applications of probability theory. e.g. Probability in Genetics.
2	ST-2501	Mathematical Statistics-1	1: Demonstrate the skill of finding generating functions such as probability generating function, moment generating function, cumulant generating function and factorial moment generating functions of different probability distributions. 2: Use the knowledge of preparing bivariate distributions of random variables in real life applications. Apply the concept of Jacobian of transformation of one dimensional and two-dimensional random variables 3: Demonstrate the skill of using curve fitting, correlation, regression, least square method and association of attributes in real life situations. 4: Apply the idea of multiple and partial correlation in business, industry and daily life activities.

2	ST-2502L	Statistics Practical	1: Demonstrate the skill of finding mean, variance and higher order moments using different generating functions. 2: Reflect the ability of preparing/finding bivariate distributions, their marginal and conditional distributions.
			3: Apply the concept of least squares to fit different curves to sample/population data, calculate the correlation coefficient, find the regression equations using MSExcell and manually both. 4: Demonstrate the skill of finding multiple and partial correlation coefficients from the sample data. Forecast the values of characteristic using the plane of regression found from available data.
3	ST-3501	Probability Distribution Theory1	1. Understand the properties of probability density functions, probability mass function and cumulative distribution functions define expectation, and introduced to its important linearity property. 2.Demonstrate the skill of finding mean, variance and higher order moments using generating functions of different distributions 3. Understand the effect of linear transformation on mean, variance and density of different distributions. 4. Demonstrate the skill of finding the moment generating functions, and appreciates its link to moments.

3	ST-3502	Statistical Methods-1	1. Demonstrate knowledge of, and a critical understanding of, the main concepts of time series analysis. Understand time series data well, and perform basic calculations and summaries of time series data 2. Interpret and use a range of index numbers commonly used in the business sector. Define an index number and explain its use. Perform calculations involving simple, composite and weighted index numbers 3. Understand the basic structure of the consumer price index (CPI) and perform calculations involving its use 4. Apply the knowledge of Construction and importance of Life table in business also in real life. Understand demographic profiles. Understand mortality and fertility rates and measurements.

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3	ST-3503L	Statistics Practical	1:Demonstrate the skill of drawing of a random sample and fitting of discrete and continues probability distributions 2: Reflect the skill of presenting data by diagrams, graphs and charts using MS-Excel and manually both. 3:Compute the mortality, fertility rates using MS-Excel and manually both. 4 :Perform a small case study on applications of discrete and continuous probability distributions, index numbers and vital statistics

4	ST-4501	Probability Distribution Theory 2	1: Demonstrate the skill of finding first four moments, generating functions of discrete and continuous probability distributions 2: Apply the idea of fitting of different discrete and continuous probability distributions. 3: Demonstrate the skill of finding characteristics functions of continuous probability distributions. 4: Apply the idea of discrete and continuous distributions in different situations
4	ST-4502	Applied Statistics-II	1: Use the knowledge of testing of hypothesis in real life applications. Apply the concept of large sample test for testing single mean, two means, single proportion, two proportions. 2: Apply the idea of non-parametric inference in business, industry and daily life activities. Understand the difference between parametric and non-parametric tests. 3: Apply the idea of official statistics and sample survey in business, industry and real life data. Understand the difference between complete enumeration and sample survey. 4: Apply the idea of simple random sampling in daily life data. Understand selection of simple random sample.

4	ST-4503L	Statistics Practical	1:Demonstrate the skill of drawing of a random sample and fitting of discrete and continues probability distributions 2:Reflect the skill of presenting data by diagrams, graphs and charts using MS-Excel and manually both. 3 :Compute the examples based on large sample tests, non-parametric tests and simple random sampling using MS-Excel and manually both. 4: Perform a small case study on applications of large sample tests and non-parametric tests.

5	ST-5501	Mathematical Statistics-III	1: Identify the Bivariate normal distribution and application in real - life studies and sustainability vales. 2: Apply the Chi-square distributions and Pearson's coefficient of Chi-square distributions in real-life situations 3: Demonstrate the skills of different probability inequality to find upper and lower bounds of probabilities of some events based on different distributions. 4: Demonstrate the skills of convergence in probability using weak law of large numbers and central limit theorem.
5	ST-5502	Statistical Inference & Design of Experiment – I	1: Demonstrate the skills of parameter, parameter space, point and interval estimation. 2: Apply the point estimators of population parameters by using the method of moments and MLE. 3: Identify the need of analysis of variance using one way classification and two way classification. 4: Apply the idea of design of experiment, demonstrate the skills of designing the experiments using CRD in real-life situations.

5	ST-5503	Applied Statistics – II	1: Identify the need of stratification of the population associated with the problem under study and perform the stratification of a statistical population. 2: Draw a stratified random sample from the population to estimate the unknown parameters of the population with their standard error. 3: Demonstrate the need of drawing systematic sample from the population and compare its efficiency with simple random sampling and stratified random sampling. 4: Apply the skill of drawing two stage sample (sub-sample) from the population and compare its efficiency with simple random sampling and stratified random sampling. 5: Extend the technique of 'process control' to 'product control' in the statistical quality control analysis and design various acceptance sampling plans.
5	ST-5504	Quantitative Techniques1(Operations Research)	1: Apply the skill of decision making process under certainty, uncertainty and risk using various methods. 2: Apply the methods of solving replacement and sequencing problems arising in business and industry. 3: Demonstrate the skills of solving problems arising in business and industry by using PERT-CPM. 4: Demonstrate the skills of solving problems arising in business and industry by using inventory models.

5	ST-5505L	Statistics Practical	1: Identify the need of stratification of the population associated with the problem under study and perform the stratification of a statistical population. 2: Draw a stratified random sample from the population to estimate the unknown parameters of the population with their standard error. 3: Demonstrate the need of drawing systematic sample from the population

			and compare its efficiency with simple random sampling and stratified random sampling. 4: Apply the skill of drawing two stage sample (sub-sample) from the population and compare its efficiency with simple random sampling and stratified random sampling. 5: Extend the technique of 'process control' to 'product control' in the statistical quality control analysis and design various acceptance sampling plans.
6	ST-6501	Mathematical Statistics-IV	1: Identify the Truncated Probability distribution and Truncated probability distributions in real - life studies and sustainability vales. 2: Apply the characteristic function of different distributions in real-life problem. 3: Apply the basic idea of Student's t-distribution and Fisher's F-distributions and their properties. 4: Demonstrate the need of Order statistic and Fisher's Z distribution

6	ST-6502	Statistical Inference &Design of Experiment-II	1: Apply the foundations of hypothesis testing (most powerful test, N-P lemma, Applications) 2: Demonstrate the testing of hypothesis (uniformly most powerful test, likelihood Ratio test) 3: Demonstrate the skills of designing the experiments using RBD, LSD in real-life situations. 4: Identify the need of factorial experimentation with main and interaction effects, total and partial confounding design.
6	ST-6503	Analytical Methods for Statistics	1: Apply the concept of Jacobian of transformations to solve problems by using analytical methods. 2: Apply the concept of Multiple Integration to solve problems by using analytical methods.

			3: Demonstrate the knowledge of Riemann Stielties Integrals in different mathematical methods. 4: Demonstrate the knowledge of Sequence and series in different mathematical methods.
6	ST-6504	Quantitative Techniques - 2 (Operations Research)	1: Apply the skill of formulating and solving liner programming problems using graphical method. 2: Demonstrate the skills of solving problems arising in business, industry and social science by using Simplex method 3: Apply the methods of solving transportation and assignment problems arising in business and industry. 4: Demonstrate the need of identifying 'game theory' like situation, construct pay-off matrix and find optimum strategies rusting in best inserts of players/competitors.

6	ST-6505L	Statistics Practical	1: Demonstrate the skill of fitting of truncated distributions such as Binomial, Poisson to real-life data. 2: Reflect the skill of drawing random samples from truncated distributions. 3: To design the experiment using RBD, LSD and factorial 4: Demonstrate the use of F, T and Z distribution in real life data. 5: Demonstrate the skills of solving problems arising in business, industry and social science by using graphical method, Simplex method, transport algorithm, Hungarian method 6: Demonstrate the need of identifying 'game theory' like situation, construct pay-off matrix and find optimum strategies rusting in best inserts of players/competitors. 7: Demonstrate the use of R-programming for achieving the course outcomes of CO-6505L.1 to CO-6505L.5
5	ST-5401	Statistics Using R	1: Apply the skill of drawing various graphs using R- programming.
			2: Demonstrate the skills of diagrams and sampling methods (SRSWR, SRSWOR) using Rprogramming. 3: Identify the need and application of measures of central tendency, dispersion, skewness and kurtosis using Rprogramming. 4: Demonstrate the skill of fitting of different distribution and fitting of lines of regression using R-programming. 5: Identify the need and application of correlation coefficient, multiple regression using R-programming

6	ST-6401	Complex Numbers	1: Identify Complex number and solve the problems using properties of complex numbers. 2: Apply the skill of solving complex modulus and conjugates and their properties. 3: Extend the technique of complex number to form analytic functions. 4: Extend the technique of complex number to form elementary functions.

Statistics for BA Students

Semester	Course code	Course name	Course Outcomes Student completing this course is able to
1	ST-1101	Statistical Methods-I	1: Identify the sources of data emission, record the data meaningfully, perform Exploratory Data 2: Analysis and draw useful conclusions. 3: Able to compute suitable measures of averages from sample data 4: Able to compute suitable measures of dispersion from sample data 5: Able to compute suitable measures of skewness, kurtosis from sample data
1	ST-1102	Mathematical Methods for Statistics-1	1: Demonstrate the skill of associating function. To find Limit and identify different Graphs and their Curves. 2: Demonstrate the skill of finding Differentiation and their applications in economics and phycology.
			3: Identify the need of Partial differentiation for Business and Economics situations. Demonstrate the Homogenous function. 4: Identify the need of matrix and determination for Business and Economics data. Reflect the Application

2	ST-2101	Applied Statistics-I	1: Demonstrate the skill of associating different sections of populations with respect to population census. 2: Demonstrate the skill of finding rates of vital events (birth, death) and measures of population growth. 3: Identify the need of Time series analysis for Business and Economics data. Demonstrate the scale of estimating components of Time series data. 4: Identify the need of Index number analysis for Business and Economics data. Reflect the application of maximizing utility in Economics.
2	ST-2102	Statistical Methods-II	1: Demonstrate the skills of finding permutations and combinations in real life situations. Apply this ideas in probability theory. 2: Apply ideas of probability theory, conditional probability, Bayes' theorem in real life situations. Apply probability ideas in various fields. 3: Apply the idea of random variables and their expected values to study the behavior of random phenomenon occurring in business, industry and daily life activities. 4: Identify the real-life situations to apply Binomial and Poisson Probability Distribution and compute related probabilities & expected values.
3	ST-3101	Mathematical Methods for Statistics-II	1: Identify the real-life situations to apply integration and compute related real life applications. 2: Identify the real-life situations to apply Interpolation and Extrapolation and compute related applications. 3: Demonstrate the need of identifying the real-life situation to apply Arithmetic Progression and Geometric Progression. 4: Apply the knowledge of Co-ordinate geometry also apply the knowledge of Necessary and sufficient conditions for parallel and perpendicular lines.

3	ST-3102	Statistical Methods-III	1. Identify the real-life situations to apply Negative Binomial, Hyper Geometric and Geometric Probability Distribution and compute related probabilities & expected values. 2. Identify the real-life situations to apply Normal Probability Distribution and compute related probabilities & expected values. 3. Apply the idea of random variables and their expected values to study the behaviour of random phenomenon occurring in business, industry and daily life activities. 4. Identify the real-life situations to apply Binomial and Poisson Probability Distribution and compute related probabilities & expected values.
3	EG-3312	Business Statistics	1. Understand the usage of sequencing problems for Solving Business Problems. 2. Apply the idea of Replacement Problems in business, industry and daily life data. 3. Demonstrate the skill of using sequencing problem, replacement problem and decision theory in real life situations. 4. Apply the idea of decision theory in business, industry and daily life activities.

4	ST-4101	Applied Statistics-II	1: Identify the real-life situations to apply large sample tests with hypothesis and different errors. 2: Identify the real-life situations to Statistical Quality Control with using Chance and assignable causes of Variation in quality. Also find tolerance limits. 3: Demonstrate the need of identifying the real-life situation to Demand law, demand function (curve), Supply law, demand function (curve) and Monopoly, Maximization of profit under monopoly. 4: Identify the real-life situations to apply small sample tests.
4	ST-4102	Operation Research	1: Apply the skill of formulating and solving liner programming problems using graphical method. 2: Apply the methods of solving transportation and assignment problems arising in business and industry 3: Apply the skill of decision making process under certainty, uncertainty and risk using various methods. 4: Demonstrate the need of identifying 'game theory' like situation, construct pay-off matrix and findoptimum strategies rusting in best inserts of players/competitors.
4	EG 4312	Statistics in Psychology and Education	1.Demonstrate the skill of finding Z-score, standard score, Normalized score, T-score, Percentile score. 2. Use the knowledge of Reliability of test scores in business and industry 3. Apply the idea of Validity of test Scores in business and industry. 4. Understand distinguish between Reliability of test scores and Validity of test Scores.