Shri Shivaji Education Society Amravati's

SCIENCE COLLEGE
Congress Nagar, Nagpur

Accredited with CGPAof 3.51 at 'A+' Grade by NAAC BangaloreA college with Potential for Excellence
An Institutional Member of APQN Recognized
Centre for Higher Learning &Research
A Mentor College under "Paramarsh Scheme" of UGC, New Delhi
A Mentor College under Paris Sparsh Scheme of Maharashtra State
An ISO 21001:2018 Certified Institution
National Institute Ranking Framework (NIRF) Rank-band: 201-300

PO, CO, PSO

STATISTICS
DEPARTMENT

PROGRAME OUTCOMES

The outcomes of a statistics program typically revolve around the development of skills in mathematical theory, and statistical methodologies. Here are some common program outcomes:

PO1: Data Analysis Skills: Graduates will be proficient in analyzing data using statistical techniques, ranging from basic descriptive statistics to more advanced inferential methods.

PO2: Statistical Software Proficiency: Familiarity with statistical software such as R, Python to manage, analyze, and visualize data effectively.

- *Tools* and *Software*: Students will gain hands-on experience with statistical software like R, Python, SPSS, or SAS to conduct data analysis and interpret results.
- *Data Visualization*: The ability to create and interpret visual representations of data through tools like Tableau, Excel, or built-in statistical software libraries.

PO3: Probability and Statistical Theory: Understanding of probability theory, distributions, hypothesis testing, and estimation techniques to solve complex real-world problems.

- *Understanding Statistical Concepts*: Students will develop a solid understanding of core statistical concepts like probability distributions, sampling methods, hypothesis testing, and confidence intervals.
- *Probability Theory*: Mastery of fundamental principles in probability, such as independent events, conditional probability, and key distributions (e.g., binomial, normal, Poisson).

PO4: Statistical Modeling and Inference

- *Regression Analysis*: Understanding linear and multiple regression models, and how to use them to make predictions and understand relationships between variables.
- *Hypothesis Testing*: Conducting hypothesis tests, understanding p-values, and drawing appropriate inferences from sample data.

PO5: Mathematical Foundations

- *Calculus* and *Linear Algebra*: Strong mathematical skills, including differential and integral calculus, as well as linear algebra, which are crucial for understanding more advanced statistical methods.
- *Mathematical Statistics*: Development of skills in mathematical statistics, including point estimation, interval estimation, and the properties of estimators.

PO6: Problem-Solving: Ability to identify, formulate, and solve statistical problems by applying appropriate models and methods.

PO7: **Design of Experiments:** Knowledge of experimental design and how to collect data in a manner that minimizes bias and maximizes reliability.

PO8: Research and Data: Understanding of ethical issues in data collection, analysis, and reporting to ensure integrity in statistical work.

- *Ethics in Data Science*: Awareness of ethical issues related to data privacy, manipulation of results, and transparency in data reporting.
- *Bias and Fairness*: Understanding the importance of fairness and avoidance of bias in data collection and analysis, especially in sensitive fields like healthcare and social sciences.

PO9: **Critical Thinking and Problem-Solving**

- *Problem-Solving*: Graduates will be able to identify statistical problems in real-world settings, develop hypotheses, and use appropriate statistical methods to solve them.
- *Critical Evaluation*: Ability to critically evaluate the quality of statistical studies and assess their assumptions, limitations, and conclusions.

PO10: Application: Ability to apply statistical methods to various fields, such as business, healthcare, economics, engineering, or social sciences.

- Application in Various Fields: Graduates will apply their statistical knowledge in diverse fields such as economics, biology, engineering, and business, depending on their area of interest.

PROGRAM SPECIFIC OUTCOMES

PSO-1: Acquire core knowledge of the basic concepts of statistics which include the major areas of Probability theory, Probability distributions, Statistical inference, Survey sampling, Designs of experiments, Applied statistics, Mathematical methods, LPP and operations research.

PSO-2: Practical exercises done will enable students to analyze and interpret data and also to draw valid conclusions. This will enable students to face real time applications.

PSO-3: Apply the concepts of statistics, Operations Research, Probability theory, Time Series, Designs of Experiment, etc. in real life problems.

PSO-4: Understand the applications of statistics concept in other disciplines such as mathematics, physics, economics, etc.

PSO-5: Provides a platform for pursuing higher studies leading to Post Graduate or Doctorate degrees.

DEPARTMENT OF STATISTICS
COURSE OUTCOMES
PROGRAMME: B.Sc.

Course Outcomes
B.Sc. 1st year SEM I – Paper I Probability Theory

CO1: Probability Axioms:- Students will demonstrate an understanding of probability, including addition and multiplication rules and conditional probability.

CO2: Random Variables:- Students will be able to define and work with both Discrete and continuous random variable, understanding their properties and behavior.

CO3: Bayes' Theorem: Students will be Applying Bayes theorem to calculate conditional Probabilities.

CO4: Independence Of Events:-Students will be Understand the concept of independent events and their significance in simplifying probability computations.

CO5: Expected Value: Students will be able to compute the expected value of random variable and understand its role in predicating long-term outcomes.

CO6: Variance and Standard Deviation:- Students will be Understand the concepts of variance and standard deviation, Using them to measure the spread of distributions.

CO7: High –Order Moments:- Students will be Familiarity with moments such as skewness and Kurtosis, and their use in describing the shape of Probability Distribution.

B.Sc. 1st year SEM I – Paper II Descriptive Statistics-I

CO1:Measures Central Tendency:- Student will be able to compute and interpret measure of central tendency (mean, median and mode) and understand when each is most appropriate.

CO2: Measures Dispersion:- Student will be able to calculating and interpreting range, variance, standard deviation, and interquartile range (IQR) to describe variability.

CO3: Tabulation:- Student will be learn Constructing frequency tables and contingency tables for both categorical and numerical Data.

CO4: Graphical presentation:- Student will be able to create and interpret various data, including bar charts, Histograms, pie charts, scatter plots, and box plots, to summarize data.

Course Outcomes
B.Sc. 1st Year SEM II – Paper I Probability Distribution

CO1: Students should be able to interpret and use **Probability Mass Function (PMF)** for discrete distribution and **Probability Distribution Function (PDF)** for continuous distribution.

CO2: Students will get familiar with basic concepts of **Standard Probability Distributions.**

CO3: Students will be able to apply the standard **discrete probability distributions** like **Binomial**, **Poisson** and **Geometric** to different real life situations

CO4: Students will be able to apply the standard **continuous probability distributions** like **Normal, Exponential, Gamma, Beta** and **Uniform** to different real life situations.

CO5: Lack of Memory property of **Geometric Distribution.**

CO6: Students will get familiar with **Raw and Central Moments** and Mathematical Expectation.

B.Sc. 1st Year SEM II – Paper II Descriptive Statistics-II

CO1: The concepts of **central tendency** and **location**.

CO2: The different concepts and **measures of dispersion**.

CO3:The different types of partition values and the concepts of **skewness and kurtosis**

CO4: The concept of bivariate data and correlation coefficient as well as regression.

CO5: Students will able to describe the correlation between interrelated variables and also able to find appropriate **regression equation** among the variables.

CO6: Concept of correlation, correlation coefficients - **Karl Pearson's correlation coefficient, Spearman's rank correlation coefficient,** multiple and partial correlation coefficients, Interaclass correlation.

Course Outcomes
B.Sc. 2nd Year SEM III – Paper I Statistical Methods

CO1: Students will understand the concept of **bivariate data**.

CO2:To extend the concept of univariate distribution to **bivariate** distribution in case of Both **discrete and continuous** random variables.

CO3:To study the concept of **Joint distribution** and the independence of two Random Variables.

CO4:To study the concept of **Marginal** distribution of two random variables.

CO5:To implement the variation and the relation between two random variables by using The concept of **covariance and correlation** between two random variables.

CO6: The basic concepts to bivariate normal distribution and study various Properties of **bivariate normal distribution.**

B.Sc.2nd Year SEM III – Paper II Economic Statistics

CO1: Students will understand the concept of **Economic Statistics**

CO2: To have detailed knowledge about various types of **index numbers** related to Economic Statistics.

CO3: To use **Consumer Price index** for regulation of D.A.

CO4: To apply **time series analysis** in various fields.

CO5: To apply **demand analysis**, **Pareto's** income distribution, **Lorenz** curve etc.

Course Outcomes
B.Sc. 2nd Year SEM IV– Paper I Statistical Inference
CO1: Students will describe various terms for **point estimation**, **interval** estimation to understand the problem of statistical inference.   **CO2:** Students will estimate the parameters with multiple criteria.   **CO3:** Students will able to analyze the **estimation techniques** and apply suitable estimation and detection techniques   **CO4:** Students will understand the **Testing of Hypothesis.**   **CO5:** Students will understand the difference between **type I and type II errors** and their importance Students will learn hypothesis testing in general and the decision rules for different situations.   **CO6:** Students will be able to handle the situation of testing for non- normal data.
B.Sc. 2nd Year SEM IV– Paper II Applied Statistics
CO1: Students will describe various terms for **Vital Statistics**   **CO2:** Students will able to analyze the **Psychological** and education Statistics.   **CO3:** Student will familiar with scaling values such as **Z-score**, **T-score** etc.   **CO4:** Student will able to use concept of **Reliability and validity**.   **CO5:** Students will be able to handle the **Rulon and kudar Richardson** Formulae of test of reliability.

Course Outcomes
B.Sc. 3rd Year SEM V– Paper I Statistical Quality Control And Linear Programming Problem
CO1: Students will be able to understand the concept of **SQC** and their different **Causes.** **CO2:** Students will familiar with the **techniques** of SQC (**Process and Product Control**) **CO3:** Use tools of SQC, Draw **control charts for mean, standard deviation and range.** **CO4:** Draw conclusion about whether process is in statistical quality control or not. **CO5:** Understand **Acceptance Sampling** concepts, **Single** and **double** sampling **CO6:** Students will understand the concept of **LPP** and general form of LPP and   Standard form of an LPP **CO7:** Understand concept of **Optimum solution of LPP** **CO8:** Solve Linear Programming problem using **Graphical method and Simplex Method**.
B.Sc. 3rd Year SEM V– Paper II Survey Sampling Technique

CO1: Students will be able to gain knowledge about official statistics; purpose and
    functions of **CSO**, **NSSO**.
CO2: Students will understand basic concepts of **sample survey**, sampling and types of
    sampling and non sampling errors.
CO3: Students will be able to plan, execute and analyses a sample survey.
CO4: Students will understand the concepts of **SRSWOR**, **SRSWR**, sampling for
    proportions.
CO5: Understand concept of stratified sampling, systematic sampling and cluster
    sampling and compare various sampling techniques.
CO6: Analyze data using various sampling techniques and draw conclusions.

Course Outcomes
B.Sc. 3rd Year SEM VI– Paper I Operation Research

CO1: Students will understand different concepts of **Network Analysis**

CO2: Draw conclusion from Network using **PERT** analysis and **CPM** analysis

CO3: Students will be able to understand concept of **Duality** in LPP, relationship between **primal** and **dual** problem and its **economic interpretation**

CO4: Students will be familiar with the **transportation problem**, its LPP formulation and solve transportation problem to obtain initial basic feasible solution and optimum solution.

CO5: Students will understand the concept of **Game theory** in various contexts.

B.Sc. 3rd Year SEM VI– Paper II Experimental Design

CO1: Students will be able to knowledge about theory of **linear** estimation, analysis of variance (ANOVA).

CO2: Students will understand basic **principles of designs** of experiments.

CO3: Students will be able to analyses data using various experimental designs **CRD**, **RBD**, **LSD** and draw conclusions.

CO4: Students will able to explain **factorial** experiments, **Yates'** method to calculate main effects and interaction effects in 2^2 and 2^3 factorial experiments.

CO5: Students will familiar with **ANOVA** for using **One** way and **two** way Classified Data.