



**SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)**

Affiliated to the University of Mumbai

**MATHEMATICS & STATISTICS**

**FYBSC Calculus-1:**

**COURSE OBJECTIVES:**

CO 1.	To enable the learner to become familiar with the fundamental properties of the real number system and its subsets, which form the basis of real analysis. Comprehend the ideas of a function's limit and continuity, and to use the many results of limits to find solutions to issues.
CO 2.	To enable the learner to have a thorough understanding of functions, a key building block of all sciences, and the ability to assess a function's properties and draw its graph.
CO 3.	To enable the learner to comprehend the ideas of a function's limit and continuity, and to use the many results of limits to find solutions to issues.

**COURSE LEARNING OUTCOMES:**

CLO 1.	The learner will be able to recall the meanings of the terms supremum, infimum, bounded sets, neighbourhoods, interior points, limit points, intervals, and their attributes.
CLO 2.	The learner will be able to understand order relation in $\mathbb{R}$ and compute supremum and infimum of a subset of $\mathbb{R}$ .
CLO.3.	The learner will be able to comprehend and apply the various results and properties of $\mathbb{R}$ .
CLO.4.	The learner will be able to define the limit of a function and to gauge if the function is continuous or not.
CLO.5.	The learner will be able to understand the algebra of limits, continuous functions, apply the property of intermediate value theorem to various continuous functions.

**FYBSC ALGEBRA AND DISCRETE MATHEMATICS-1:**  
**COURSE OBJECTIVES:**

CO 1.	To provide the learner the necessary skills to work on the numerical applications of the concepts while understanding the structure of the natural number and integer systems.
CO 2.	To enable the learner become competent in numerical computations using division, GCD, prime number concepts, and congruence relations.
CO 3.	To develop in the learner, the ability to use equivalence relations and associated features to differentiate between sets of numbers.
CO 4.	To enable the learner to develop the capacity to comprehend, apply, and solve numerical problems involving the principles of functions and binary operations.

**COURSE LEARNING OUTCOMES:**

CLO 1.	The learner will be able to comprehend and apply the concepts of binary operators, relations, functions, prime number congruences, division of integers, and GCD.
CLO 2.	Through logical inductions, the learner will be able to prove mathematical propositions and develop mathematical ideas from the foundational axioms.
CLO.3.	In order to fulfill the requirements of the numerical assignments, the learner will be able to identify and construct bijective and invertible functions.
CLO.4.	The learner will be able to identify and compute factors of a polynomial with multiplicity over the set of real and complex numbers, and also identify irreducible polynomials.

**FYBSC Calculus-2:**  
**COURSE OBJECTIVES:**

CO 1.	To develop in the learner, an understanding of the concepts of derivative of a function.
CO 2.	To impart knowledge of the methods of finding the higher order derivative of the given function.
CO 3.	To enable the learner to understand the applications of the derivative of a function.
CO 4.	To develop an understanding of the concepts and application of Mean Value theorems.

**COURSE LEARNING OUTCOMES:**

CLO 1.	The learner can find the derivative of a function on the set of real numbers.
CLO 2.	The learner will be able to find the higher order derivatives of the functions.
CLO 3.	The learner will be able to apply the various concepts of differentiation on the functions to find the nature of the function.
CLO 4.	The learner will be able to apply the concepts of Mean Value theorems and find the approximate value of the function at a certain point.

## **FYBSC ALGEBRA AND DISCRETE MATHEMATICS-2:**

### **COURSE OBJECTIVES:**

1. To provide the learner the necessary skills to work on the numerical applications of the concepts while understanding the process of counting in discrete sets.
2. To enable the learner become competent in the concepts of polynomials and create models using them.
3. To develop in the learner, an appreciation of the different applications of the permutation maps and derangements and apply them to find solutions to real-life problems.
4. To enable the learner to develop the capacity to comprehend, apply, and solve numerical problems involving the counting principles.

### **COURSE LEARNING OUTCOMES:**

1. The learner will understand the properties of polynomials under the binary operations and solve them using the techniques
2. The learner will be able to use various counting principles, permutation and combination in numerical problems and solve them with interpretation.
3. The learner will apply the concepts of Permutation maps and derangements in understanding the various methods of placement.

## **FYBA/FYBSC DESCRIPTIVE STATISTICS-1:**

### **COURSE OBJECTIVES:**

CO 1.	To introduce the techniques of data collection and its presentation.
CO 2.	To emphasize the need for numerical summary measures for data analysis.
CO 3.	To learn to present the data graphically.
CO 4,	To understand and apply the descriptive techniques of statistical analysis to

### **COURSE LEARNING OUTCOMES:**

CLO 1.	The learner will be able to distinguish between different types of scales of the characteristics.
CLO 2.	The learner will be able to compare the different types of data and describe various methods of data collection.
CLO 3.	The learner will be able to construct Univariate and Bivariate frequency distribution , Cumulative frequency distribution.
CLO 4.	The learner will be able to create appropriate graphical representation of the given data.
CLO 5.	The learner will be able to compute and interpret the relation between the qualitative characteristics in the data.
CLO 6.	The learner will be able to comprehend , compute and interpret the measures of central tendency and dispersion.
CLO 7.	The learner will be able to identify the nature of skewness and kurtosis of the data - mathematically & graphically.

## **FYBA/FYBSC DESCRIPTIVE STATISTICS-2:**

### **COURSE OBJECTIVES:**

CO 1.	To understand the nature and magnitude of relationship between the quantitative characteristics in the data.
CO 2.	To create suitable mathematical models that best represents the data given.
CO 3.	To enable the learners to understand forecasting techniques to predict trend and seasonal variation in the time series.
CO 4.	To enable the learners to understand the construction of index numbers & its applications in various field.

### **COURSE LEARNING OUTCOMES:**

CLO 1.	The learner will be able to compute the numerical measures to identify the direction and strength of linear relationship between two variables.
CLO 2.	The learner will be able to build a simple linear regression model and interpret regression coefficients and coefficient of determination.
CLO 3.	The learner will be able to identify the relevant mathematical model which fits the data
CLO 4.	The learner will be able to identify various components of time series.
CLO 5.	The learner will be able to apply the appropriate methods to evaluate the impact of the different components of time series on the data.
CLO 6.	The learner will be able to comprehend the construction of different index numbers and to apply the methods in different situations.

## **FYBSC/ SYBA STATISTICAL METHODS-1:**

### **COURSE OBJECTIVES:**

CO 1.	To understand the basic concepts of probability and compute probability in various situations.
CO 2.	To learn the various concepts involved in creating the probability distribution of discrete random variables.
CO 3.	To learn the properties of the standard probability distributions of discrete random variables.
CO 4.	To fit appropriate distribution to the given data sets and interpret the results.

### **COURSE LEARNING OUTCOMES:**

CLO 1.	The learner will be able to differentiate between random and non-random experiments.
CLO 2.	The learner will be able to compute the probabilities of various types of events.
CLO 3.	The learner will be able to understand the concepts of a discrete random variable and its probability distribution.
CLO 4.	The learner will be able to compute different measures of the probability distribution using techniques involving discrete random variables.
CLO 5.	The learner will be able to apply standard discrete probability distributions to data based on real life situations.

## **SYBA OPERATIONS RESEARCH AND INDUSTRIAL STATISTICS -1**

### **COURSE OBJECTIVES:**

CO 1.	To orient students with different optimization techniques which will influence the overall quality of decisions.
CO 2.	To learn different mathematical models for efficient allocation of limited resources
CO 3.	To learn techniques to minimize the cost of transporting goods from different sources to different destinations.
CO 4.	To understand the methods of solving different assignment problems.
CO 5.	To learn techniques to sequence the various jobs in order to minimize the total time taken for processing the jobs.

#### **COURSE LEARNING OUTCOMES:**

CLO 1.	The learner will be able to formulate a mathematical model for a given data.
CLO 2.	The learner will be able to solve and find optimum solution to a linear programming problem graphically and using mathematical techniques.
CLO 3.	The learner will be able to obtain the dual model of the given problem.
CLO 4.	The learner will be able to find optimal solutions using various methods to a transportation problem.
CLO 5.	The learner will be able to formulate an assignment problem and solve using Hungarian method.
CLO 6.	The learner will be able to process a solution to a sequencing problem using Johnson's method

#### **FYBSC/ SYBA STATISTICAL METHODS-2: COURSE OBJECTIVES:**

CO 1.	To learn the various concepts involved in creating the probability distribution of continuous random variables..
CO 2.	To learn the properties of the standard probability distributions of continuous random variables.
CO 3.	To understand the significance of the normal distributions and its application in data analysis.
CO 4.	To introduce two branches of Statistical Inferential theory – Estimation theory and Testing of hypothesis.
CO 5.	To assess population characteristics on the basis of sample using estimation and hypothesis testing theory

#### **COURSE LEARNING OUTCOMES:**

CLO 1.	The learner will be able to create a probability density function and compute the cumulative distribution function for a continuous random variable.
CLO 2.	The learner will be able to apply the properties of standard continuous probability distributions to different data based on situations.
CLO 3.	The learner will be able to distinguish between point estimation and interval estimation of the population parameters.
CLO 4.	The learner will be able to frame a hypothesis and compute the probabilities of error that could arise while testing.
CLO 5.	The learner will be able to test the hypothesis by examining one or two random samples of the population.

## **SYBA OPERATIONS RESEARCH AND INDUSTRIAL STATISTICS -2**

### **COURSE OBJECTIVES:**

CO 1.	To understand the techniques of planning , scheduling and controlling the various factors of different activities of a project.
CO 2.	To be acquainted with skills in strategy planning and decision making.
CO 3.	To learn the techniques of evaluating the different options available for performing a task.
CO 4.	To analyze situations in which players make decisions that puts them in the most preferred position.
CO 5.	To learn to create and evaluate different strategies involved in planning using techniques of game theory.

### **COURSE LEARNING OUTCOMES:**

CLO 1.	The learner will be able to construct activity networks for the project using probabilistic and deterministic time estimates
CLO 2.	The learner will be able to identify the critical activities of the project using different techniques
CLO 3.	The learner will be able to optimize the project cost and time (any two variables).
CLO 4.	The learner will be able to update the project schedule after incorporating the changes in various factors of the activities.
CLO 5.	The learner will be able to distinguish between pure strategy and mixed strategy game and finding optimum game strategy.
CLO 6.	The learner will be able to understand different decision –making models and make effective decisions.