AC: 02.06.2025 ITEM NO: 24.1

Deccan Education Society's

Kirti M. Doongursee College of Arts, Science and Commerce (AUTONOMOUS)

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for
Program: Bachelor of Science
Course: F.Y.B.Sc.
Subject: Statistics

Choice Based Credit System (CBCS)
with effect from
Academic Year 2024-2025
(NEP 2020)

PROGRAM OUTCOMES

PO	Description
A student completing Bachelor's Degree in **Science** Program will be able to	
PO1	**Disciplinary Knowledge:** Demonstrate comprehensive knowledge of the disciplines that form a part of a graduate Programme. Execute strong theoretical and practical understanding generated from the specific graduate Programme in the area of work.
PO2	**Critical Thinking and Problem solving:** Exhibit the skills of analysis, inference, interpretation and problem-solving by observing the situation closely and design the solutions.
PO3	**Social competence:** Display the understanding, behavioral skills needed for successful social adaptation, work in groups, exhibits thoughts and ideas effectively in writing and orally.
PO4	**Research-related skills and Scientific temper:** Develop the working knowledge and applications of instrumentation and laboratory techniques. Able to apply skills to design and conduct independent experiments, interpret, establish hypothesis and inquisitiveness towards research.
PO5	**Trans-disciplinary knowledge:** Integrate different disciplines to uplift the domains of cognitive abilities and transcend beyond discipline-specific approaches to address a common problem.
PO6	**Personal and professional competence:** Performing dependently and collaboratively as a part of team to meet defined objectives and carry out work across interdisciplinary fields. Execute interpersonal relationships, self-motivation and adaptability skills and commit to professional ethics.
PO7	**Effective Citizenship and Ethics:** Demonstrate empathetic social concern and equity centered national development, and ability to act with an informed awareness of moral and ethical issues and commit to professional ethics and responsibility.
PO8	**Environment and Sustainability:** Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

Deccan Education Society's

Kirti M. Doongursee College (Autonomous)

Proposed Curriculum as per NEP 2020

Year of implementation- 2024-25

Name of the Department: Statistics

Semester	Course Code	Course Title	Vertical	Credit
I	24STAMJ111	Statistical Methods– I	Major	2
	24STAMJP11	Practical I	Major	2
	24STAVC141	Elementary To Advanced Excel	VSC	2
	24STASE151	Introduction To Excel	SEC	2
II	24STAMJ211	Statistical Methods– II	Major	2
	24STAMJP21	Practical II	Major	2
	24STAOE241	Introduction to Statistics-I	OE	2
	24STAVC241	Optimization Models Using Excel	VSC	2
	24STASE251	Statistics Using MS-Excel	SEC	2

Course Code	MAJOR SEM – I	Credits	Lectures /Week
24STAMJ111	Paper I - Statistical Methods - I	2	2

Course Outcomes:

After successful completion of this course, students would be able to:

CO1: Recall fundamental concepts of probability, including sample space, events, probability distributions, and moments, as well as definitions and properties of discrete random variables.

CO2: Explain probability theorems, including addition, multiplication theorem on probability, along with the properties of standard discrete distributions, moments, and bivariate distributions.

CO3: Apply probability concepts and Bayes' theorem to solve real world problems, compute mean, variance, and moments for discrete distributions, and calculate probabilities for joint, marginal, and conditional distributions.

CO4: Evaluate the impact of conditional probability and independence on real-world scenarios, and interpret relationships between random variables using measures like covariance, correlation, and joint probability distributions.

Unit	Topics	No of Lectures
I	**Elementary Probability Theory** a) Trial, random experiment, sample point and sample space. b) Definition of an event. Operation of events, mutually exclusive and exhaustive events. c) Classical (Mathematical) and Empirical definitions of Probability and their properties. d) Theorems on Addition and Multiplication of probabilities. e) Independence of events, pairwise and mutual independence for three event, Conditional probability. f) Bayes theorem and its applications.	15

II	**Discrete Random Variable and Some Standard Discrete Distributions** a) Random variable. Definition and properties of probability distribution and cumulative distribution function of discrete random variable. b) Raw and Central moments (definition only) and their relationship (up to order four). c) Expectation of a random variable. Theorems on Expectation & Variance. d) Discrete Uniform, Binomial and Poisson distributions and derivation of their mean and variance. **Bivariate Probability Distributions:** **Two dimensional Discrete random variables:** e) Joint Probability mass function and its properties f) Distribution function of (X,Y) and its properties g) Definition of raw and central moments, covariance, correlation coefficient, h) Independence and correlation between two variables i) Marginal and conditional probability distributions j) Conditional expectation, conditional variance.	**15**

References:

1. Gupta V. K. & Kapoor S. C.: Fundamentals of Mathematical Statistics, Sultan & Chand.
2. Mood A. M., Graybill F. A. and Boes D. C.: Introduction to the Theory of Statistics, McGraw Hill.
3. Hogg, R. V., Tanis, E.A. and Rao J.M.: Probability and Statistical Inference, Seventh Edition, Pearson Education, New Delhi.

Course Code	SEM I	Credits	Lectures/ Week
24STAMJP11	**Practical - I**	**2**	**4**

Course Outcomes:

After successful completion of this course, students would be able to:

CO1: Recall the steps for constructing tables, graphs, and diagrams, and the formulas for measures of central tendency, dispersion, probability, and discrete distributions to set up numerical problems.

CO2: Explain the significance of numerical solutions obtained from tabulation, graphs, and statistical measures. Interpret the role of probability and random variables in solving real-world scenarios numerically.

CO3: Apply statistical methods to solve numerical problems, such as constructing frequency tables, calculating measures of central tendency and dispersion, and computing probabilities for discrete random variables and distributions.

CO4: Analyze numerical data by interpreting variability and relationships through measures like standard deviation and correlation. Solve advanced problems involving discrete bivariate distributions and evaluate dependencies or independence between variables using joint probabilities.

Practical No.	Title	No. of lectures
1	Tabulation	60
2	Attributes	
3	Classification of Data	
4	Graphs and Diagrams	
5	Measures of central tendency- I	
6	Measures of central tendency- II	
7	Measures of dispersion	
8	Probability - I	
9	Probability - II	
10	Discrete Random Variables - I	
11	Discrete Random Variables - II	
12	Discrete Distributions	
13	Discrete Bivariate Random Variables	

References:

1. Gupta V. K. & Kapoor S. C.: Fundamentals of Mathematical Statistics, Sultan & Chand.
2. Mood A. M., Graybill F. A. and Boes D. C.: Introduction to the Theory of Statistics,

McGraw Hill.
3. Hogg, R. V., Tanis, E.A. and Rao J.M.: Probability and Statistical Inference, Seventh Edition, Pearson Education, New Delhi.
4. Hogg R. V. and Crag R. G.: Introduction to Mathematical Statistics
5. Gupta S. P. (2002): Statistical Methods, Sultan Chand and Sons, New Delhi.

Course Code	VOCATIONAL SKILL COURSE SEM – I	Credits	Lectures/ Week
24STAVC141	Paper I - Elementary To Advanced Excel	2	4

Course Outcomes:

After successful completion of this course, students would be able to:

CO1: Identify and describe basic operations of MS Excel, including data entry, autofill, graph creation, and the use of mathematical and text functions.

CO2: Explain the application of Excel tools like sorting, filtering, pivot charts, and formulas to organize, analyze, and represent data.

CO3: Apply Excel functions to create tables, graphs, and pivot charts, perform data sorting and filtering, and solve problems using mathematical and logical formulas such as IF and TEXT functions.

CO4: Analyze datasets by organizing and summarizing information with pivot charts, advanced filtering techniques, and logical functions to identify patterns and trends.

Practical No.	Title	No. of lectures
1	Basic Formatting	60
2	Data Entry and Autofill Function	
3	Working with Data	
4	Customizing Excel	
5	Graphs and Diagrams	
6	Basic Text Functions	
7	Introduction to Cell Referencing	
8	Working with Multiple Sheets	
9	Mathematical Functions Using MS-Excel	
10	Sort and Filter	
11	Tabulation using Pivot charts	
12	If Function	

References:

1. Paul McFedries and Greg Harvey: Excel All-in-one for Dummies, John Wiley and Sons, Inc.
2. George Wahlberg: Excel 2022 From basic to advanced.
3. Manisha Nigam: Advanced Analytics with Excel 2019, Second Edition, BPB Publications.

Course Code	SKILL ENHANCEMENT COURSE SEM – I	Credits	Lectures /Week
24STASE151	**Paper I – Introduction to Excel**	**2**	**4**

Course Outcomes:

After successful completion of this course, students would be able to:

CO1: Identify and describe basic operations of MS Excel, including data entry, autofill, graph creation, and the use of mathematical and text functions.

CO2: Explain the application of Excel tools like sorting, filtering, pivot charts, and formulas to organize, analyze, and represent data.

CO3: Apply Excel functions to create tables, graphs, and pivot charts, perform data sorting and filtering, and solve problems using mathematical and logical formulas such as IF and TEXT functions.

CO4: Analyze datasets by organizing and summarizing information with pivot charts, advanced filtering techniques, and logical functions to identify patterns and trends.

Paper I

Practical No.	Title	No. of lectures
1	Basic Formatting	60
2	Data Entry and Autofill Function	
3	Working with Data	
4	Customizing Excel	
5	Graphs and Diagrams	
6	Basic Text Functions	
7	Introduction to Cell Referencing	
8	Working with Multiple Sheets	
9	Mathematical Functions Using MS-Excel	
10	Sort and Filter	
11	Tabulation using Pivot charts	
12	If Function	

References:

1. Paul McFedries and Greg Harvey: Excel All-in-one for Dummies, John Wiley and Sons, Inc.
2. George Wahlberg: Excel 2022 From basic to advanced.
3. Manisha Nigam: Advanced Analytics with Excel 2019, Second Edition, BPB Publications.

Course Code	MAJOR SEM – II	Credits	Lectures /Week
24STAMJ211	**Paper I - Statistical Methods – II**	**2**	**2**

Course Outcomes:

After successful completion of this course, students would be able to:

CO1: Identify and describe the key concepts related to continuous random variables, their probability distributions, and the properties of standard continuous distributions

CO2: Understand and explain the probability density function, cumulative distribution function, and their graphical representations, along with the expectation and properties of continuous random variables.

CO3: Apply the properties of the Normal distribution and its approximation to Binomial and Poisson distributions, and calculate estimators, sampling distributions, and standard errors for large samples.

CO4: Analyze continuous bivariate random variables, including joint probability density functions, marginal and conditional distributions, covariance, and correlation, to understand the relationships between two variables.

Unit	Topics	No of Lectures
I	**Continuous random variable and Some Standard Continuous Distributions** a) Concept of Continuous random variable and properties ofits probability distribution. b) Probability density function and cumulative distribution function. Their graphical representation. c) Expectation of a random variable and its properties. d) Measures of location, dispersion, skewness and kurtosis. e) Raw and central moments (simple illustrations). f) Uniform, Exponential (location scale parameter), Derivations of mean and variance. **Continuous bivariate random variables:**	**15**

	a) Joint Probability density function and its properties b) Distribution function of (X,Y) and its properties c) Definition of raw and central moments, covariance, correlation coefficient, d) Independence and correlation between two variables e) Marginal and conditional probability distributions f) Conditional expectation, conditional variance.	
II	**Normal distribution and Elementary topics on Estimation** a) Normal distribution, Properties of Normal distribution (without proof). b) Normal approximation to Binomial and Poisson distribution (statement only). Properties of Normal curve. Use of normal tables. c) Sample from a distribution, Concept of a statistic, estimate and its sampling distribution. Parameter and its estimator. d) Concept of bias and standard error of an estimator. e) Central Limit theorem (statement only). f) Sampling distribution of sample means and sample proportion. (For large sample only). g) Standard errors of sample mean and sample proportion. h) Point and Interval estimate of single mean, single proportion from sample of large size.	**15**

References:

1. Rohatgi V. K. and Saleh A. K. Md. E. (2002): An introduction to probability and

statistics, John Wiley and Sons.
2. Mood A. M., Graybill F. A. and Boes D. C.: Introduction to the Theory of Statistics, McGraw Hill.
3. Hogg, R. V., Tanis, E.A. and Rao J.M.: Probability and Statistical Inference, Seventh Edition, Pearson Education, New Delhi.

Course Code	SEM II	Credits	Lectures/ Week
24STAMJP21	**Practical - II**	**2**	**4**

Course Outcomes:

After successful completion of this course, students would be able to:

CO1: Recognize and define the core principles of correlation analysis and regression analysis, including the interpretation of correlation coefficients and regression models to explore relationships between variables.

CO2: Explain the techniques of curve fitting, time series analysis, and index numbers, demonstrating how these methods can be used to model trends, forecast future values, and interpret patterns in data.

CO3: Utilize the concepts of continuous random variables and their corresponding distributions (uniform, exponential, and normal), and calculate their key properties such as probability, expectation, and variance for problem-solving.

CO4: Assess and evaluate continuous bivariate random variables, applying the central limit theorem and normal approximation to estimate parameters and analyze data through advanced statistical methods.

Paper I

Practical No.	Title	No. of lectures
1	Correlation analysis - I	60
2	Correlation analysis - II	
3	Regression analysis - I	
4	Regression analysis - II	
5	Fitting of curve	
6	Time series	
7	Index numbers	
8	Continuous Random Variables	
9	Continuous Bivariate Random Variables	
10	Uniform and Exponential Distribution	
11	Normal Distribution	
12	Applications of central limit theorem and normal approximation	
13	Estimation	

References:

1. Gupta V. K. & Kapoor S. C.: Fundamentals of Mathematical Statistics, Sultan & Chand.
2. Mood A. M., Graybill F. A. and Boes D. C.: Introduction to the Theory of Statistics,

McGraw Hill.
3. Hogg, R. V., Tanis, E.A. and Rao J.M.: Probability and Statistical Inference, Seventh Edition, Pearson Education, New Delhi.
4. Hogg R. V. and Crag R. G.: Introduction to Mathematical Statistics
5. Gupta S. P. (2002): Statistical Methods, Sultan Chand and Sons, New Delhi.

Course Code	OPEN ELECTIVE SEM – II	Credits	Lectures /Week
24STAOE241	**Paper I - Introduction to Statistics-I**	**2**	**2**

Course Outcomes:

After successful completion of this course, students would be able to:

CO1: Define key concepts of statistics, including the types of characteristics, methods of data collection, and types of data, the concept of central tendency and basic measures like median, mode, and arithmetic mean.

CO2: Explain the construction of tabulation and univariate frequency distributions for discrete and continuous data. Illustrate the graphical and diagrammatic representation of data using histograms, frequency curves, bar diagrams, and pie charts. Describe the significance of central tendency and compare the merits and demerits of median, mode, and arithmetic mean.

CO3: Demonstrate the ability to create and interpret tabulations, frequency distributions, and graphical representations. Calculate measures of central tendency such as median, mode, and arithmetic mean, and estimate the mode using graphical methods.

CO4: Examine datasets to analyze the suitability of different graphical and tabular methods for representation. Assess the relevance and effectiveness of various measures of central tendency for summarizing data, evaluating their applicability based on dataset characteristics.

Unit	Topics	No of Lectures
I	**Elementary Data processing and Graphing techniques:** a) Definition of Statistics. b) Types of Characteristics. c) Methods of data collection: (i) Primary data: concept of questionnaire and a schedule. (ii) Secondary data. d) Types of data: Qualitative and quantitative data: Time series data and cross section data, discrete and continuous data. e) Tabulation.	**15**

	f) Univariate frequency distribution of discrete and continuous variables. g) Graphical representation of frequency distribution by Histogram, frequency curve. a) Diagrammatic representation using bar diagrams and pie chart.	
II	**Measures of central tendency** a) Concept of central tendency of data. b) Locational averages: Median, Mode. c) Mathematical averages: Arithmetic mean. d) Merits and demerits of using different measures & their applicability. e) Estimating Mode from graph.	**15**

References:

1. Gupta V. K. & Kapoor S. C.: Fundamentals of Mathematical Statistics, Sultan & Chand
2. Hogg R. V. and Crag R. G.: Introduction to Mathematical Statistics
3. Gupta S. P. (2002): Statistical Methods, Sultan Chand and Sons, New Delhi.

Course Code	VOCATIONAL SKILL COURSE SEM – II	Credits	Lectures/ Week
24STAVC241	**Paper I - Optimization Models using Excel**	**2**	**4**

Course Outcomes:

After successful completion of this course, students would be able to:

CO1: Identify the steps for formulating linear programming problems and recognize the Excel tools required for graphical and simplex method solutions. Recall the concepts of dual problems, transportation, and assignment problems.

CO2: Explain how to construct and interpret linear programming problems using Excel. Illustrate the formulation of dual problems, transportation problems, and assignment problems, and describe the use of Excel for solving these problems.

CO3: Use Excel to solve linear programming problems graphically and with the simplex method. Apply Excel functions and solver tools to optimize transportation and assignment problems, including their variants.

CO4: Evaluate the solutions of linear programming, transportation, and assignment problems obtained using Excel. Analyze the relationship between primal and dual problems, and assess optimization outcomes to suggest improvements.

Practical No.	Title	No. of lectures
1	Conditional Formatting	60
2	Advanced Formatting	
3	VLOOKUP	
4	HLOOKUP	
5	COUNTIF & COUNTIFS	
6	SUMIF & SUMIFS	
7	STRING & DATE Functions	
8	Linear Programming Problem: - Graphical Method	
9	Linear Programming Problem: - Simplex method	
10	Transportation Problem	
11	Assignment Problem	
12	Optimization Models using Excel	

References:

1. Paul McFedries and Greg Harvey: Excel All-in-one for Dummies, John Wiley and Sons, Inc.
2. George Wahlberg: Excel 2022 From basic to advanced.
3. Manisha Nigam: Advanced Analytics with Excel 2019, Second Edition, BPB Publications.

Course Code	SKILL ENHANCEMENT COURSE SEM – II	Credits	Lectures/ Week
24STASE251	**Paper I – Statistics using MS-Excel**	**2**	**4**

Course Outcomes:

After successful completion of this course, students would be able to:

CO1: Identify the tools and features in MS Excel required for graphical representation, tabulation, and statistical calculations, including measures of central tendency and dispersion.

CO2: Explain the process of creating charts and tables in Excel to represent and summarize data. Describe the use of Excel functions to calculate measures of central tendency, dispersion, and probabilities for discrete and continuous distributions.

CO3: Use MS Excel to create and interpret graphs and tabulate data effectively. Calculate and analyze measures of central tendency, dispersion, and probabilities for both discrete and continuous distributions using Excel formulas and tools.

CO4: Evaluate and interpret the outputs generated in Excel for graphical and tabular data representations. Assess the suitability of various statistical measures and probability distributions for real-world datasets, analyzing trends and patterns.

Paper I

Practical No.	Title	No. of lectures
1	Graphical representation using MS Excel	60
2	Tabulation using MS Excel	
3	Frequency distribution	
4	Measures of Central Tendency	
5	Measures of Dispersion	
6	Discrete probability distributions - I	
7	Discrete probability distributions - II	
8	Continuous probability distributions – I	
9	Continuous probability distributions – II	
10	Correlation Analysis	
11	Regression Analysis	
12	Time series	

References:

1. David M. Levine, Kathryn A. Szabat, David F. Stephan: Statistics for Managers Using Microsoft Excel, Pearson Education.
2. Michael R. Middleton, Robert Stine: Data Analysis Using Microsoft Excel, Pearson Education.
3. Neil J. Salkind: Excel Statistics: A Quick Guide, SAGE Publications.

Evaluation Scheme for First Year (UG) under NEP (2 credits)

I. Internal Evaluation for Theory Courses – 20 Marks

1) Continuous Internal Assessment(CIA) Assignment - 10 marks

2) Continuous Internal Assessment(CIA) ONLINE Unit Test – 10 marks

II. External Examination for Theory Courses – 30 Marks

Duration: 1 Hours

Theory question paper pattern: All questions are compulsory.

Question	Based on	Marks
Q.1	Unit I	15
Q.2	Unit II	15

- All questions shall be compulsory with internal choice within the questions.
- Each Question may be sub-divided into sub questions as a, b, c, d, etc. & the allocation of Marks depends on the weightage of the topic.

III. Practical Examination

- Each core subject carries 50 Marks.
- Duration: 2 Hours for each practical course.
- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam

NOTE: To pass the examination, attendance is compulsory in both Internal & External (Theory + Practical) Examinations.