



Shiromani Gurudwara Prabandhak Committee's

**Guru Nanak Khalsa College of Arts, Science and Commerce
(Autonomous)**

Matunga, Mumbai – 400 019, Maharashtra

Program: Bachelor of Science

Syllabus

Course: F.Y B.Sc. STATISTICS

(As per NEP guidelines-DSC model)

With effect from Academic Year 2026 - 2027



Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)
Program Structure

Department of Mathematics & Statistics

Detail Syllabus of FYBSc Statistics as a Major Subject as per NEP-2020

Semester – I

Course Code	Course Name	Teaching Hours		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
GNKUSSTAMJ1101/ GNKUSSTAMJ1P101	Major: Statistical Methods-I	45	30	3	1	4
GNKUSSTAMI1101/ GNKUSSTAMI1P101	Minor (Physics/ Mathematics/ Economics): Statistical Methods-I	45	30	3	1	4
	Open elective (OE_1)	15	30	1	1	2
	Open elective (OE_2)	15	30	1	1	2
GNKUSSTAVSC101	VSC (Vocational Skill course) Major specific: Descriptive Statistics-I	--	60	--	2	2
GNKUSSTASEC101	SEC (Skill Enhancement Course) Major specific: Computation Using Python and MS Excel	--	60	--	2	2
GNKUSAEC101	AEC (Ability Enhancement Course)	30	--	2	--	2
GNKUSVEC101	VEC (Value Education Course)	30	--	2	--	2
GNKUSCC101	CC (Co-Curriculum)	60		2		
Total Credit				22		

Semester – II

Course Code	Course Name	Teaching Hours		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
GNKUSSTAMJ1102/ GNKUSSTAMJ1P102	Major: Statistical Methods-II	45	30	3	1	4
GNKUSSTAMI1102/ GNKUSSTAMI1P102	Minor (Physics/ Mathematics/ Economics): Statistical Methods-II	45	30	3	1	4
	Open elective (OE_1)	15	30	1	1	2
	Open elective (OE_2)	15	30	1	1	2
GNKUSSTAVSC102	VSC (Vocational Skill course) Major specific: Descriptive Statistics-II	--	60	--	2	2
GNKUSSTASEC102	SEC (Skill Enhancement Course) Major specific: Data Analysis Using Python and MS Excel	--	60	--	2	2
GNKUSIKS102	IKS (Indian Knowledge System)	30	--	2	--	2
GNKUSAEC102	AEC (Ability Enhancement Course)	30	--	2	--	2
GNKUSVEC102	VEC (Value Education Course)	30	--	2	--	2
Total Credit				22		



**G N KHALSA COLLEGE OF ARTS, SCIENCE & COMMERCE(AUTONOMOUS),
MATUNGA, MUMBAI-400019**

MOTTO

Essence of Wisdom is Service to Humanity

VISION

To emerge as a Centre of Excellence in Higher Education.

MISSION

To create strong analytical minds with scientific temper, fostering global competencies through the spirit of humanism thereby bringing about holistic development of the students by remaining in sync with the teachings of Guru Nanak Dev Ji.

QUALITY POLICY

To attain excellence in all our endeavours namely teaching, research and continuing education; adopt self-evaluation as a measure for continuous improvement and ensure accountability.

Based on the provided motto, vision, mission, and quality policy, program outcomes for a Science program of our college are:

Undergraduate Science Program Outcomes:

PO1	Foundational Understanding: Develop a foundational understanding of core scientific principles and theories across various disciplines of science.
PO2	Analytical Skills: Develop analytical and problem-solving skills to critically analyse scientific problems and apply scientific methodologies.
PO3	Global Perspective: Gain a global perspective by understanding diverse scientific issues and incorporating ethical considerations in scientific practices.
PO4	Research Awareness: Gain awareness of research methodologies and techniques, preparing for future research endeavours.
PO5	Holistic Development: Experience holistic development by embracing values of humanism, empathy, and social responsibility in scientific pursuits.
PO6	Communication Skills: Enhance communication skills to effectively convey scientific concepts to diverse audiences.
PO7	Continuous Learning: Develop a commitment to lifelong learning and staying updated with advancements in science.
PO8	Ethical Practices: Understand and adhere to ethical standards in scientific research and practice.



Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)
Department of Mathematics and Statistics

Programme: B.Sc. Statistics

Programme Specific Outcomes (PSOs) for B.Sc. in Statistics

Sr. No.	A student completing B.Sc. in Statistics will be able to:
PSO 1	Acquire core knowledge of the basic concepts of statistics which include the major areas of probability distributions, statistical inference, survey sampling, designs of experiments, non- parametric inference, and operations research.
PSO 2	Apply the concepts of statistics, Operations Research, Probability theory, Time Series, Designs of Experiment, etc. in real life problems.
PSO 3	Practical exercises done will enable students to analyse and interpret data and to draw valid conclusions. This will enable students to face real time applications.
PSO 4	Understand the applications of statistics concept in other disciplines such as mathematics, physics, economics, etc.
PSO 5	Compute statistical measures using software and programs.
PSO 6	Acquire skills to write competitive examinations and get opportunities for job placements in various sectors
PSO 7	Provides a platform for pursuing higher studies leading to Postgraduate or Doctorate degrees.



Shiromani Gurudwara Prabandhak Committee's

**Guru Nanak Khalsa College of Arts, Science and Commerce
(Autonomous)**

Matunga, Mumbai – 400 019, Maharashtra

Program: Bachelor of Science

Syllabus

Course: F. Y. B. Sc. STATISTICS

Semester I

Major

Name of the paper: Statistical Methods-I

(As per NEP guidelines-DSC model)

With effect from Academic Year 2026 - 2027



Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)
Department of Mathematics and Statistics

Course: F. Y. B. Sc. Statistics Major

Semester: I

Course Title: Statistical Methods-I

Course Code: GNKUSSTAMJ1101

Credits: 3

No of lectures hours: 45

Marks: 45

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1.	To understand events and its types along with basic principles of counting of events.
2.	To understand the basic concepts of probability, and its definition. To understand difference between Classical and Empirical and definitions of probability.
3.	To understand the fundamental law of addition and multiplication of probability
4.	To understand concept of univariate and bivariate discrete random variables and its distributions. To compute and interpretate mean and standard deviation of distributions.
5	To introduce discrete probability distributions such as Uniform, Bernoulli, Binomial, Poisson and hypergeometric distributions along with their properties, applications and relationship amongst them.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Understand the basic concepts of counting of events using permutations and combinations.	1	1,2	U, Ap
CO 2	Know definitions and terminologies used in probability theory, Computation of probability and conditional probabilities.	1,2	1,3	Ap
CO 3	Write p.m.f and to evaluate mean and variance of univariate random variable.	1,2 & 4	1,2,3	U, Ap, E
CO4	Find the marginal and conditional distributions of bivariate random variables along with their mean and variance.	1,2 & 4	1,2,3	U, Ap, E
CO 5	Understand some standard discrete distributions and their properties	1,2 & 4	1,2,3	Ap, E

Major

Unit		Title Statistical Methods - I	No. of lectures	CO Mapping
Unit 1		Elementary Probability Theory	15	
	1.1	Definitions: Trial, random experiment, sample point and sample space, event, mutually exclusive and exhaustive events. Operations on events.	05	1
	1.2	Classical (Mathematical) and Empirical (Statistical) definitions of Probability and their properties. Addition and Multiplication theorem of probabilities.	05	2
	1.3	Independence of events, pairwise and mutual independence for three events, Conditional probability, Bayes 'theorem and its applications.	05	4
Unit 2		Discrete Random Variable and its probability distribution	15	
	2.1	Random variable. Definition and properties of probability distribution and cumulative distribution function of discrete random variable. Raw and Central moments (definition only) and their relationship (up to order four).	05	3 & 4
	2.2	Concepts of Skewness and Kurtosis and their uses. Univariate random variable: Expectation and Variance, Theorems on expectation and variance. Bivariate random variables: Joint probability mass function of two discrete random variables, Marginal and Conditional distributions.	05	3 & 4
	2.3	Theorems on Expectation and Variance for bivariate random variables, Covariance and Coefficient of Correlation. Independence of two random variables.	05	3 & 4
Unit 3		Standard Discrete Distributions	15	
	3.1	Discrete Uniform, Bernoulli, Binomial and Poisson distribution and derivation of their mean and variance.	05	4 & 5
	3.2	Recurrence relation for probabilities of Binomial and Poisson distributions. Poisson approximation to Binomial distribution.	05	4 & 5
	3.3	Hypergeometric distribution, Binomial approximation to Hypergeometric distribution.	05	4 & 5

References:

1. Introduction to the theory of statistics: A. M. Mood, F.A. Graybill, D. C. Boyes, Third Edition; McGraw-Hill Book Company. (1957)
2. Introduction to Mathematical Statistics: R.V. Hogg, A.T. Craig; Fourth Edition; Collier, McMillan Publishers. (2005)
3. John E. Freund's Mathematical Statistics: I. Miller, M. Miller; Eighth Edition; Pearson Education Inc. (2014)
4. Introduction to Mathematical Statistics: P.G. Hoel; Fourth Edition; John Wiley & Sons Inc. (2016)
5. Fundamentals of Mathematical Statistics: S.C. Gupta, V.K. Kapoor; Eighth Edition; Sultan Chand & Sons, Tenth edition (2000)

Examination:

- **Internal Evaluation (30 Marks).**
- **End Semester theory examination (45 Marks).**
- **Combined passing of 40% with minimum 20% in Internal Component.**

Course: F. Y. B. Sc. Statistics Major Practical
Semester: I
Course Title: Practical: Statistical Methods-I
Course Code: GNKUSSTAMJ1P101
Credits: 01
No. of Practical hours: 30
Marks: 25 (60:40)

Course Objectives

Sr. No.	Course objectives
The course aims at:	
1.	Develop analytical skills by solving the problem of probability and discrete probability distribution.
2.	Realization of events, outcomes of random experiments.
3.	Understanding the concept of univariate and bivariate distributions
4.	Understanding concept of various discrete probability distributions.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Calculate probabilities of events given a probability distribution.	1	1,2	U, Ap
CO 2	Represent the probability distribution of a discrete random variable using a table, and probability mass function.	1,2	1,3	Ap
CO 3	Identify the discrete probability distributions and compute the probability of the related problem	1,2 & 4	1,2,3	U, Ap, E
CO 4	Evaluate mean and variance of univariate distributions.	1,2 & 4	1,2,3	U, Ap, E
CO 5	Find the marginal and conditional distributions of bivariate random variables along with their mean and variance.	1,2 & 4	1,2,3	Ap, E

List of Practical

Note: Each Practical will have 4 hours, 2 hours of intensive coaching and 2 hours of practice problem solving.

1. Probability-I
2. Probability-II (Based on Addition and Multiplication Theorem)
3. Probability-III (Based on Bayes' Theorem)
4. Discrete Random Variables-I
5. Discrete Random Variables-II
6. Bivariate Probability Distribution-I
7. Bivariate Probability Distribution-II
8. Discrete Uniform Distribution

9. Binomial Distribution
10. Poisson Distribution
11. Poisson Approximation to Binomial Distribution
12. Hypergeometric Distribution

References:

1. Introduction to the theory of statistics: A. M. Mood, F.A. Graybill, D. C. Boyes, Third Edition; McGraw-Hill Book Company. (1957)
2. Introduction to Mathematical Statistics: R.V. Hogg, A.T. Craig; Fourth Edition; Collier McMillan Publishers. (2005)
3. Probability and Statistical Inference: R.V. Hogg, E. A. Tannis, Fourth Edition; Collier McMillan Publishers. (2001)
4. John E. Freund's Mathematical Statistics: I. Miller, M. Miller; Eighth Edition; Pearson Education Inc. (2014)
5. Fundamentals of Mathematical Statistics: S.C. Gupta, V.K. Kapoor; Eighth Edition; Sultan Chand & Sons, Tenth edition (2000)

Examination:

- **Internal Evaluation (10 Marks).**
- **End Semester practical examination (15 Marks).**
- **75% attendance in the regular practical with certified journal is compulsory for appearing the practical examination.**



Shiromani Gurudwara Prabandhak Committee's

Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)

Matunga, Mumbai – 400 019, Maharashtra

Program: Bachelor of Science / Arts

Syllabus

Course: F. Y. B. Sc. / F. Y. B. A.

Semester I

Minor

Name of the paper: Statistical Methods-I

(As per NEP guidelines-DSC model)

With effect from Academic Year 2026 - 2027



Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)
Department of Mathematics and Statistics

Course: F. Y. B. Sc. / F. Y. B. A Minor

Semester: I

Course Title: Statistical Methods-I

Course Code: GNKUSSTAMI1101/ GNKUASTAMI101

Credits: 3

No of lectures Hours: 45

Marks: 45

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1.	To understand events and its types along with basic principles of counting of events.
2.	To understand the basic concepts of probability, and its definition. To understand difference between Classical and Empirical and definitions of probability.
3.	To understand the fundamental law of addition and multiplication of probability
4.	To understand concept of univariate and bivariate discrete random variables and its distributions. To compute and interpretate mean and standard deviation of distributions.
5.	To introduce discrete probability distributions such as Uniform, Bernoulli, Binomial, Poisson and hypergeometric distributions along with their properties, applications and relationship amongst them.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Understand the basic concepts of counting of events using permutations and combinations.	1	1,2	U, Ap
CO 2	Know definitions and terminologies used in probability theory, Computation of probability and conditional probabilities.	1,2	1,3	Ap
CO 3	Write p.m.f and to evaluate mean and variance of univariate random variable.	1,2 & 4	1,2,3	U, Ap, E
CO 4	Find the marginal and conditional distributions of bivariate random variables along with their mean and variance.	1,2 & 4	1,2,3	U, Ap, E
CO5	Understand some standard discrete distributions and their properties	1,2 & 4	1,2,3	Ap, E

Minor

Unit		Title Statistical Methods - I	No. of lectures	CO Mapping
Unit 1		Elementary Probability Theory	15	
	1.1	Definitions: Trial, random experiment, sample point and sample space, event, mutually exclusive and exhaustive events. Operations for events.	05	1
	1.2	Classical (Mathematical) and Empirical (Statistical) definitions of Probability and their properties. Addition and Multiplication theorem of probabilities (without Proof).	05	2
	1.3	Independence of events, pairwise and mutual independence for three events, Conditional probability, Bayes 'theorem (without proof) and its applications.	05	4
Unit 2		Discrete Random Variable and its Probability Distribution	15	
	2.1	Random variable. Definition and properties of probability distribution and cumulative distribution function of discrete random variable. Raw and Central moments (definition only) and their relationship (up to order four).	05	3 & 4
	2.2	Concepts of Skewness and Kurtosis and their uses. Univariate random variable: Expectation and Variance, theorem on expectation and variance. Bivariate random variables: Joint probability mass function of two discrete random variables, Marginal and Conditional distributions.	05	3 & 4
	2.3	Theorems on Expectation and Variance for bivariate random variables (without proof), Covariance and Coefficient of Correlation. Independence of two random variables.	05	3 & 4
Unit 3		Standard Discrete Distributions	15	
	3.1	Discrete Uniform, Bernoulli, Binomial and Poisson distributions and derivation of their mean and variance.	05	4 & 5
	3.2	Recurrence relation for probabilities of Binomial and Poisson distributions. Poisson approximation to Binomial Distribution (without proof)	05	4 & 5
	3.3	Hypergeometric distribution, Binomial approximation to Hypergeometric distribution (without proof)	05	4 & 5

References:

1. Introduction to the theory of statistics: A. M. Mood, F.A. Graybill, D. C. Boyes, Third Edition; McGraw-Hill Book Company. (1957)
2. Introduction to Mathematical Statistics: R.V. Hogg, A.T. Craig; Fourth Edition; Collier, McMillan Publishers. (2005)
3. John E. Freund's Mathematical Statistics: I. Miller, M. Miller; Eighth Edition; Pearson Education Inc. (2014)
4. Introduction to Mathematical Statistics: P.G. Hoel; Fourth Edition; John Wiley & Sons Inc. (2016)
5. Fundamentals of Mathematical Statistics: S.C. Gupta, V.K. Kapoor; Eighth Edition; Sultan Chand & Sons, Tenth edition (2000)

Examination:

- **Internal Evaluation (30 Marks).**
- **End Semester theory examination (45 Marks).**
- **Combined passing of 40% with minimum 20% in Internal Component.**

Course: F. Y. B. Sc. / F. Y. B. A. Statistics Minor Practical
Semester: I
Course Title: Practical: Statistical Methods-I
Course Code: GNKUSSTAMI1P101
Credits: 01
No. of Practical hours: 30
Marks: 25 (60:40)

Course Objectives

Sr. No.	Course objectives
The course aims at:	
1.	Develop analytical skills by solving the problem of probability and discrete probability distribution.
2.	Realization of events, outcomes of random experiments.
3.	Understanding the concept of univariate and bivariate distributions
4.	Understanding concept of various discrete probability distributions.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Calculate probabilities of events given a probability distribution.	1	1,2	U, Ap
CO 2	Represent the probability distribution of a discrete random variable using a table, and probability mass function.	1,2	1,3	Ap
CO 3	to identify the discrete probability distributions and compute the probability of the related problem	1,2 & 4	1,2,3	U, Ap, E
CO 4	To evaluate mean and variance of univariate distributions.	1,2 & 4	1,2,3	U, Ap, E
CO 5	To find the marginal and conditional distributions of bivariate random variables along with their mean and variance.	1,2 & 4	1,2,3	Ap, E

List of Practical

1. Probability-I
2. Probability-II (Based on Addition and Multiplication Theorem)
3. Probability-III (Based on Bayes' Theorem)
4. Discrete Random Variables-I
5. Discrete Random Variables-II
6. Bivariate Probability Distribution-I
7. Bivariate Probability Distribution-II
8. Discrete Uniform Distribution
9. Binomial Distribution

10. Poisson Distribution
11. Poisson Approximation to Binomial Distribution
12. Hypergeometric Distribution

References:

1. Introduction to the theory of statistics: A. M. Mood, F.A. Graybill, D. C. Boyes, Third Edition; McGraw-Hill Book Company. (1957)
2. Introduction to Mathematical Statistics: R.V. Hogg, A.T. Craig; Fourth Edition; Collier McMillan Publishers. (2005)
3. Probability and Statistical Inference: R.V. Hogg, E. A. Tannis, Fourth Edition; Collier McMillan Publishers. (2001)
4. John E. Freund's Mathematical Statistics: I. Miller, M. Miller; Eighth Edition; Pearson Education Inc. (2014)
5. Fundamentals of Mathematical Statistics: S.C. Gupta, V.K. Kapoor; Eighth Edition; Sultan Chand & Sons, Tenth edition (2000)

Examination:

- **Internal Evaluation (10 Marks).**
- **End Semester practical examination (15 Marks).**
- **75% attendance in the regular practical with certified journal is compulsory for appearing the practical examination.**



Shiromani Gurudwara Prabandhak Committee's

**Guru Nanak Khalsa College of Arts, Science and Commerce
(Autonomous)**

Matunga, Mumbai – 400 019, Maharashtra

Program: Bachelor of Science

Syllabus

Course: F. Y. B. Sc. STATISTICS

Semester I

Vocational Skill Course (VSC)

Name of the paper: Descriptive Statistics-I

(As per NEP guidelines-DSC model)

With effect from Academic Year 2026 - 2027



Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)
Department of Mathematics and Statistics

Course: F. Y. B. Sc. Statistics (Vocational Enhancement Course)

Semester: I

Course Title: Descriptive Statistics-I

Course Code: GNKUSSTAVSC101

Credits: 2 (Practical based)

No of Practical Hours: 60

Marks: 50

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	To know the statistics as a subject and its scope.
2	To learn data collection process
3	To learn how to identify variable under study.
4	To describe the basic features of the data in a study by summarizing.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Define statistical terminologies.	1,2	3	U & An
CO 2	Understand the concept of a frequency distribution as an organized display showing where all the individual scores are located on the scale of measurement.	1,2 &3	1 & 2	U & An
CO 3	Organize data into a regular or a grouped frequency distribution table and understand data that are presented in a table.	1,2 &3	1 , 2 ,6	U & An
CO 4	Compute and interpret measures of centre and spread of data	1,2 &3	2,4 &4	U & An

Vocational Skill Enhancement

	List of Practical on Descriptive Statistics-I	Practical hours	CO Mapping
Practical 1	Sources and Types of Data		
Content	Sources of Data: primary data, secondary data. Types of Data: Quantitative and qualitative data, Time series data, Discrete and Continuous data.	05	1
Practical 2	Scales of measurements		
Content	Scales of measurements: Nominal scale, Ordinal scale, Ratio and Interval scale.	05	1,2
Practical 3	Designing Questionnaire and data collection		
Content	Designing Questionnaire to collect primary data.	05	1,2
Practical 4	Classification of Data		
Content	Frequency distribution of the data.	05	1,2,3
Practical 5	Attributes		
Content	Classification for two and three attributes, Consistency and independence of data with reference of attributes, Association between two attributes. Yule's coefficient of association, Yule's coefficient of colligation and relationship between them.	05	1,2,3
Practical 6	Measures of central tendency-I		
Content	Mathematical averages: Arithmetic mean and its properties, weighted mean, combined mean, Geometric mean, Harmonic mean.	05	3 &4
Practical 7	Measures of central tendency-II		
Content	Positional Averages: Median, Mode, Partition Values (Quartiles, Deciles, and Percentiles. Empirical relationship between mean, median and mode	05	3 &4
Practical 8	Measures of dispersion-I		
Content	Absolute and Relative measures of dispersion: Range, Quartile Deviation, Mean absolute deviation.	05	2,3 &4
Practical 9	Measures of dispersion-II		
Content	Standard deviation, Variance, Combined variance.	05	2,3 &4
Practical 10	Moments		
Content	Raw moments and Central moments up to fourth order and relations between them.	05	2,3 &4
Practical 11	Skewness, Kurtosis and Boxplot		
Content	Concept of Skewness. Measures of Skewness: Karl Pearson's, Bowley's and Coefficient of skewness based on moments. Measure of Kurtosis, Box Plot, Concept of Kurtosis. Measure of Kurtosis, Box Plot	05	3 &4
Practical 12	Data Analysis Using Jamovi Software	05	2,3 &4

Reference:

1. Gupta and Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, Tenth Edition. (2000)
2. Kothari C.R.: Research Methodology, Wiley Eastern Limited, Second Edition. (2004)
3. Goon A.M., Gupta M.K., Dasgupta B.: Fundamentals of Statistics, Volume II: The World Press Private Limited, Calcutta (1968).

Examination:

- **Internal evaluation (20 Marks).**
- **End Semester practical examination (30 Marks).**
- **75% attendance in the regular practical with certified journal is compulsory for appearing the practical examination.**



Shiromani Gurudwara Prabandhak Committee's

**Guru Nanak Khalsa College of Arts, Science and Commerce
(Autonomous)**

Matunga, Mumbai – 400 019, Maharashtra

Program: Bachelor of Science

Syllabus

Course: FY B.Sc. STATISTICS

Semester I

Skill Enhancement Course (SEC)

**Name of the paper: Fundamentals of Python and MS Excel
(Practical Based)**

(As per NEP guidelines-DSC model)

With effect from Academic Year 2026 - 2027

Course: F. Y. B.Sc. Statistics (Skill Enhancement Course)

Semester-I

Course Title: Fundamentals of Python and Ms Excel

Course Code: GNKUSSTASEC101

Credits: 02

No. of Practical (Hours): 60

Marks: 50 (60:40)

Sr. No.	Course objectives
	Python is a widely used general-purpose, high-level programming language. Python is also versatile and widely used in every technical field, such as Machine Learning, Artificial Intelligence, Web Development, Mobile Application, Desktop Application, Scientific Calculation, etc. Excel one of the most basic but powerful tools for data analysis. Aims of this course is to familiarize the students basic of Python and Excel. The course aims at:
1.	built the concept of computer program and programming language to the students of Mathematics and Demonstrating the basic mechanics and navigation of an Excel spreadsheet.
2.	understand the use of control and loop statements while writing program in Python.
3.	To use Python language to solve the mathematical problems and to use and utility of functions and formulas on excel spreadsheet.
4.	Manipulate data using data names and ranges, filters and sort, and validation lists in Excel and using conditional statements of Python.
5.	Create different view of data using different types of charts and diagram in Excel

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Apply Python's control and loop statements to write program.	1, 2	1, 2, 3	R, Ap
CO 2	Compute mathematical identities using Python program.	1, 3, 5	1, 2, 5	R, Ap, An
CO 3	Develop the foundation for advance Python programming.	1,5,7	1, 3, 6	R, C, An, E
CO 4	Manipulate data using data names and ranges, filters and sort, and validation lists in Excel and using conditional statements of Python	2, 3, 4	2, 4 ,6	R, C, Ap,U
CO 5	Create different view of data using different types of charts and diagram in Excel	2, 5, 7	2, 4, 6	C, Ap, An, U

Skill Enhancement Course

	Title	Practical hours	CO Mapping
	Fundamentals of Python and MS Excel		
Unit I	Fundamental of Python Programming	15 hrs	
1.1	Introduction to Digital Computer: component of computer, hardware, software, programming language, Basic of Python programming: Python identifiers, reserved keywords, variables, basic input and output function, different data types and simple program to illustrate the uses of data types	10	1
1.2	Operators, string operations, concatenation, repetition, slicing.	05	1
Unit 2	Control and loop statements in Python	15 hrs	
2.1	Loop and control statement: for loop, while loop, break and continue statement and program based on this. if elif else statement and examples. Solving mathematical problems like finding GCD, LCM, sorting, finding divisor, checking primality of a number, finding prime in the given range, finding roots of the quadratic equations etc.	8 hrs	2
2.2	String, List, tuples, dictionary, and related functions. Built in functions. Type conversion, standard mathematical, statistical, date, and time.	7 hrs	3
Unit 3	Working on MS-Excel Spreadsheet	15 hrs	
3.1	1. Creating and Navigating worksheets and adding information to worksheets 2. Types of data, entering different types of data such as texts, numbers, dates, functions. 3. Quick way to add data Auto complete, Autocorrect, Auto fill, Auto fit. Undo and Redo. 4. Moving data, contiguous and non-contiguous selections, Selecting with keyboard. Cut-Copy, Paste. Adding and moving columns or rows. Inserting columns and rows. 5. Find and replace values. Spell check. 6. Formatting cells, Numbers, Date, Times, Font, Colors, Borders, Fills. 7. Adding, removing, hiding, and renaming worksheets. 8. Add headers/Footers to a Workbook. Page breaks, preview.	8 hrs	3
	1. Creating formulas, inserting functions, cell references, 2. Absolute, Relative (within a worksheet, other worksheets, and other workbooks).		

3.2	3. Creating and using templates, using predefined templates, Adding protection option. 4. Creating and Linking Multiple Spreadsheets. 5. Using formulas and logical operators. 6. Creating and using named ranges. 7. Creating Formulas that use reference to cells in different worksheets	7 hrs	3,4
Unit 4	Excel Functions in data analysis	15 hrs	
4.1	1. Financial functions: FV, PV, PMT, PPMT, IPMT, NPER, 2. RATE 3. Date functions TODAY, NOW, DATE, TIME, DAY, 4. MONTH, YEAR, WEEKDAY, DAYS360 5. String functions LEFT, RIGHT, MID, LEN, UPPER, LOWER, PROPER, TRIM, FIXED. 6. Database Functions LOOKUP, VLOOKUP, HLOOKUP. 7. Conditional Logic functions IF, Nested IF, COUNTIF, 8. SUMIF, AVERAGEIF	8 hrs	4
4.2	1. Sorting, Subtotal. 2. Pivot Tables- Building Pivot Tables, Pivot Table regions, Rearranging Pivot Table. 3. Searching of Data, filtering of data, conditional formatting Filter with customized condition	7 hrs	5

Reference books:

1. Problem Solving and Python Programming, E. Balagurusamy, McGraw-Hill Education (2018).
2. Doing Math with Python, Amit Saha, No Starch Press.
3. Statistical Analysis with Excel for Dummies, Joseph Schmuller, Wiley Publications.
4. Straightforward Statistics with Excel, C. Bowen, Second Edition.
5. Statistical Fundamentals: Using Microsoft Excel for Univariate and Bivariate Analysis, Rovai A.P.

Examination:

- **Internal evaluation (20 Marks).**
- **End Semester practical examination (30 Marks).**
- **75% attendance in the regular practical with certified journal is compulsory for appearing the practical examination.**



Shiromani Gurudwara Prabandhak Committee's

Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)

Matunga, Mumbai – 400 019, Maharashtra

Program: Bachelor of Science

Syllabus

Course: F. Y. B. Sc. STATISTICS

Semester II

Major

Name of the paper: Statistical Methods-II

(As per NEP guidelines-DSC model)

With effect from Academic Year 2026 - 2027



Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)
Department of Mathematics and Statistics

Course: F. Y. B.Sc. Statistics Major

Semester: II

Course Title: Statistical Methods-II

Course Code: GNKUSSTAMJ1102

Credits: 3

No of lectures Hours: 45

Marks: 45

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1.	To understand continuous random variable and probability density function
2.	To learn continuous probability distributions such as rectangular and exponential distributions with their properties and applications.
3.	To know about Normal probability distribution and properties of normal probability curve and to learn to calculate normal probabilities using standard normal probability table.
4.	To recognize the difference between a population and a sample, between a parameter and a statistic.
5.	To understand a concept of point estimation and interval estimation for large sample.
6.	To learn about statistical testing of hypothesis.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Understand the concept of a probability density function (pdf) for continuous random variables.	1 & 2	1,2	U,Ap,An
CO 2	Calculate and interpret moments of continuous random variables and Compute probabilities	1,2,3	1,2,3	U,Ap,An & E
CO 3	Understand continuous uniform, exponential and normal distribution and their applications.	1,2,3,&4	1,2,3,	U,Ap,An & E
CO 4	Understand concept of C.LT, sampling distribution, parameter estimator and estimate.	1,2,3,&4	2,3,4,5	U,Ap,An & E
CO5	Understand concept of hypothesis testing. Interpret the results of hypothesis tests in the context of the research problem.	1,2,3,&4	1,2,3,5	U,Ap,An & E

Major

Unit		Title Statistical Methods - II	No. of lectures	CO Mapping
Unit 1		Continuous Random Variable	15	
	1.1	Concept of continuous random variable and properties of its probability distribution.	05	1
	1.2	Probability density function and cumulative distribution function its properties. Expectation of a random variable and its properties	05	1 & 2
	1.3	Measures of location, dispersion. Raw and central moments (simple illustrations). Skewness and Kurtosis.	05	1 & 2
Unit 2		Standard Continuous Distributions	15	
	2.1	Uniform, Exponential (location scale parameter), memoryless property of exponential distribution.	05	3
	2.2	Derivations of mean, median and variance for Uniform and Exponential distributions, Normal Distribution and its properties (without proof).	05	2 & 3
	2.3	Properties of Normal curve. Use of normal tables. Normal approximation to Binomial and Poisson distributions (statement only).	05	3
Unit 3		Elementary topics on Estimation and Testing of Hypothesis	15	
	3.1	Sampling Distribution and Estimation: Population and Sample from a distribution. Concept of statistics, estimate and its sampling distribution. Parameter and its estimator. Concept of bias and standard error of an estimator. Central Limit theorem (CLT) (statement only). Sampling distribution of sample mean and sample proportion. (For large sample only)	05	4
	3.2	Standard errors of sample mean and sample proportion. Point and Interval estimate of single mean, single proportion from sample of large size. Testing of Hypothesis: Concept of hypothesis, simple and composite hypothesis, null and alternate hypothesis, types of errors, critical region and level of significance.	05	4
	3.3	Large sample tests using CLT: Test of significance for (i) testing specified value of single population mean. (ii) testing specified value for the difference of two means. (iii) testing specified value of single population proportion. (iv) testing specified value for the difference of two population proportions.	05	5

References:

1. Gupta and Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, Tenth Edition. (2000)
2. Hoel P.G.: Introduction to Mathematical Statistics, Asia Publishing House. (1971)

3. Medhi J.: Statistical Methods, An Introductory Text, Second Edition, New Age International Ltd. (1996)
4. David S.: Elementary Probability, Cambridge University Press, First Edition. (1994)

Examination:

- **Internal Evaluation (30 Marks).**
- **End Semester theory examination (45 Marks).**
- **Combined passing of 40% with minimum 20% in Internal Component.**

Course: F.Y. B.Sc. Statistics Major Practical
Semester: II
Course Title: Practical: Statistical Methods-II
Course Code: GNKUSSTAMJ1P102
Credits: 01
No of Practical hours: 30
Marks: 25 (60:40)

Sr. No.	Course objectives
The course aims at:	
1.	To understand continuous random variable and probability density function
2.	To learn continuous probability distributions such as rectangular and exponential distributions with their properties and applications.
3.	To know about Normal probability distribution and properties of normal probability curve and to learn to calculate normal probabilities using standard normal probability table.
4.	To recognize the difference between a population and a sample, between a parameter and a statistic.
5	To understand a concept of point estimation and interval estimation for large sample.
6	To learn about statistical testing of hypothesis.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Understand the concept of a probability density function (pdf) for continuous random variables and Describe important continuous probability distributions and its application.	1& 2	1,2	U,Ap,An
CO 2	Calculate and interpret moments of continuous random variables and Compute probabilities	1,2,3	1,2,3	U,Ap,An & E
CO 3	Critically evaluate research questions to formulate appropriate null and alternative hypotheses. Interpret the results of hypothesis tests in the context of the research problem.	1,2,3,&4	1,2,3,	U,Ap,An & E
CO 4	Choose and apply the correct hypothesis test based on the nature of the data and the research question.	3,&4	2,3,4,5	U,Ap,An & E
CO5	Understand how hypothesis testing fits into the broader process of research design and data analysis.	1,2,,&4	1,2,3,5	U,Ap,An & E

List of Practical

1. PDF and CDF of Continuous distribution.
2. Measures associated with continuous random variable
3. Continuous Uniform Distribution
4. Exponential Distribution

5. Normal Distribution
6. Sampling Distribution
7. Point Estimation
8. Interval Estimation
9. Formulation of Hypothesis
10. Testing of hypothesis
11. Large Sample tests for population mean
12. Large Sample test for population proportion.

References:

1. Gupta and Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, Tenth Edition. (2000)
2. Hoel P.G.: Introduction to Mathematical Statistics, Asia Publishing House. (1971)
3. Medhi J.: Statistical Methods, An Introductory Text, Second Edition, New Age International Ltd. (1996)
4. David S.: Elementary Probability, Cambridge University Press, First Edition. (1994)

Examination:

- **Internal Evaluation (10 Marks).**
- **End Semester practical examination (15 Marks).**
- **75% attendance in the regular practical with certified journal is compulsory for appearing the practical examination.**



Shiromani Gurudwara Prabandhak Committee's

**Guru Nanak Khalsa College of Arts, Science and Commerce
(Autonomous)**

Matunga, Mumbai – 400 019, Maharashtra

Program: Bachelor of Science / Arts

Syllabus

Course: F. Y. B. Sc. / F. Y. B. A.

Semester II

Minor

Name of the paper: Statistical Methods-II

(As per NEP guidelines-DSC model)

With effect from Academic Year 2026 - 2027



Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)
Department of Mathematics and Statistics

Course: F. Y. B. Sc. / F. Y. B. A. Minor

Semester: II

Course Title: Statistical Methods-II

Course Code: GNKUSSTAMI1102

Credits: 3

No of lectures hours: 45

Marks: 45

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1.	To understand continuous random variable and probability density function
2.	To learn continuous probability distributions such as rectangular and exponential distributions with their properties and applications.
3.	To know about Normal probability distribution and properties of normal probability curve and to learn to calculate normal probabilities using standard normal probability table.
4.	To recognize the difference between a population and a sample, between a parameter and a statistic.
5.	To understand a concept of point estimation and interval estimation for large sample.
6.	To learn about statistical testing of hypothesis.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Understand the concept of a probability density function (pdf) for continuous random variables.	1& 2	1,2	U,Ap,An
CO 2	Calculate and interpret moments of continuous random variables and Compute probabilities	1,2,3	1,2,3	U,Ap,An & E
CO 3	Understand continuous uniform, exponential and normal distribution and their applications.	1,2,3,&4	1,2,3,	U,Ap,An & E
CO 4	Understand concept of C.LT, sampling distribution, parameter estimator and estimate.	3,&4	2,3,4,5	U,Ap,An & E
CO 5	Understand concept of hypothesis testing. Interpret the results of hypothesis tests in the context of the research problem.	1,2,,&4	1,2,3,5	U,Ap,An & E

Minor

Unit		Title Statistical Methods - II	No. of lectures	CO Mapping
Unit 1		Continuous Random Variable	15	
	1.1	Concept of continuous random variable and properties of its probability distribution.	05	1
	1.2	Probability density function and cumulative distribution function. Their graphical representation. Expectation of a random variable and its properties.	05	1 & 2
	1.3	Measures of location, dispersion. Raw and central moments (simple illustrations). Skewness and Kurtosis.	05	1 & 2
Unit 2		Standard Continuous Distributions	15	
	2.1	Uniform, Exponential (location scale parameter), memoryless property of exponential distribution.	05	3
	2.2	Derivations of mean, median and variance for Uniform and Exponential distributions. Normal Distribution: Properties of Normal distribution (without proof).	05	2 & 3
	2.3	Properties of Normal curve. Use of normal tables. Normal approximation to Binomial and Poisson distributions (statement only).	05	3
Unit 3		Elementary topics on Estimation and Testing of Hypothesis	15	
	3.1	Sampling Distribution and Estimation: Population and Sample from a distribution. Concept of a statistic, estimate and its sampling distribution. Parameter and its estimator. Concept of bias and standard error of an estimator. Central Limit theorem (CLT) (statement only). Sampling distribution of sample mean and sample proportion. (For large sample only)	05	4
	3.2	Standard errors of sample mean and sample proportion. Point and Interval estimate of single mean, single proportion from sample of large size. Testing of Hypothesis: Concept of hypothesis, simple and composite hypothesis, null and alternate hypothesis, types of errors, critical region and level of significance.	05	4
	3.3	Large sample tests using CLT: Test of significance for (i) testing specified value of single population mean. (ii) testing specified value for the difference of two means. (iii) testing specified value of single population proportion. (iv) testing specified value for the difference of two population proportions.	05	5

References:

1. Gupta and Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, Tenth Edition. (2000)
2. Hoel P.G.: Introduction to Mathematical Statistics, Asia Publishing House. (1971)
3. Medhi J.: Statistical Methods, An Introductory Text, Second Edition, New Age International Ltd. (1996)
4. David S.: Elementary Probability, Cambridge University Press, First Edition. (1994)

Examination:

- **Internal Evaluation (30 Marks).**
- **End Semester theory examination (45 Marks).**
- **Combined passing of 40% with minimum 20% in Internal Component.**

Course: F.Y. B.Sc. Statistics Minor Practical
Semester: II
Course Title: Practical: Statistical Methods-II
Course Code: GNKUSSTAMI1P102
Credits: 1
No. of Practical hours: 30
Marks: 25 (60:40)

Sr. No.	Course objectives
The course aims at:	
1.	To understand continuous random variable and probability density function
2.	To learn continuous probability distributions such as rectangular and exponential distributions with their properties and applications.
3.	To know about Normal probability distribution and properties of normal probability curve and to learn to calculate normal probabilities using standard normal probability table.
4.	To recognize the difference between a population and a sample, between a parameter and a statistic.
5	To understand a concept of point estimation and interval estimation for large sample.
6	To learn about statistical testing of hypothesis.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Understand the concept of a probability density function (pdf) for continuous random variables and Describe important continuous probability distributions and its application.	1& 2	1,2	U,Ap,An
CO 2	Calculate and interpret moments of continuous random variables and Compute probabilities	1,2,3	1,2,3	U,Ap,An & E
CO 3	Critically evaluate research questions to formulate appropriate null and alternative hypotheses. Interpret the results of hypothesis tests in the context of the research problem.	1,2,3,&4	1,2,3,	U,Ap,An & E
CO 4	Choose and apply the correct hypothesis test based on the nature of the data and the research question.	3,&4	2,3,4,5	U,Ap,An & E
CO5	Understand how hypothesis testing fits into the broader process of research design and data analysis.	1,2,,&4	1,2,3,5	U,Ap,An & E

List of Practical

1. P.DF and CDF of Continuous distribution.
2. Measures associated with continuous random variable
3. Continuous Uniform Distribution
4. Exponential Distribution
5. Normal Distribution
6. Sampling Distribution
7. Point Estimation
8. Interval Estimation
9. Formulation of Hypothesis
10. Testing of hypothesis
11. Large Sample tests for population mean
12. Large Sample test for population proportion.

References:

1. Gupta and Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, Tenth Edition. (2000)
2. Hoel P.G.: Introduction to Mathematical Statistics, Asia Publishing House. (1971)
3. Medhi J.: Statistical Methods, An Introductory Text, Second Edition, New Age International Ltd. (1996)
4. David S.: Elementary Probability, Cambridge University Press, First Edition. (1994)

Examination:

- **Internal Evaluation (10 Marks).**
- **End Semester practical examination (15 Marks).**
- **75% attendance in the regular practical with certified journal is compulsory for appearing the practical examination.**



Shiromani Gurudwara Prabandhak Committee's
Guru Nanak Khalsa College of Arts, Science and Commerce
(Autonomous)

Matunga, Mumbai – 400 019, Maharashtra

Program: Bachelor of Science

Syllabus

Course: F. Y. B.Sc. STATISTICS

Semester II

Vocational Skill Course (VSC)

Name of the paper: Descriptive Statistics-II

(As per NEP guidelines-DSC model)

With effect from Academic Year 2026 - 2027



Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)
Department of Mathematics and Statistics

Course: F. Y. B.Sc. Statistics Vocational Skill Course

Semester: II

Course Title: Descriptive Statistics-II

Course Code: GNKUSSTAVSC102

Credits: 2 (Practical based)

No of Practical Hours: 60

Marks: 50

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	Gain a fundamental understanding of correlation and regression as statistical techniques used to measure and analyze relationships between variables.
2	Learn to identify and differentiate between different types of relationships between variables, including linear and non-linear relationships.
3	Explore practical applications of correlation and regression analysis in various fields such as social sciences, business, economics, and health sciences.
4	Learn how to recognize time series data, distinguish it from cross-sectional data, and understand its characteristics such as trend, seasonality, and noise
5	Study real-world applications of time series analysis in various domains such as finance, economics, marketing, and environmental science.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Define correlation and regression in the context of statistical analysis. Differentiate between correlation (strength and direction of relationship) and causation.	1 & 2	1,2	U, Ap & An
CO 2	Estimate regression coefficients (β_0 and β_1) using least squares estimation. Assess the goodness of fit using the coefficient of determination (R^2) and interpret its meaning.	1,2,3	1,2,3	U, Ap, An & E
CO 3	Apply correlation and regression techniques to real-world data sets from various disciplines	1,2,3,&4	1,2,3,	U, Ap, An & E
CO 4	Understanding and modelling data points collected over time, making it crucial for various fields such as economics, finance, weather forecasting, and more.	3,&4	2,3,4,5	U, Ap & An
CO 5	Introduce and apply basic time series models	1,2,,&4	1,2,3,5	U, Ap & An

Vocational Skill Enhancement

	List of Practical on Descriptive Statistics-II	Practical hours	CO Mapping
Practical 1	Data Visualization		
Content	Bivariate data, Scatter diagram, Covariance between two variables,	05	1
Practical 2	Correlation		
Content	Product Moment correlation coefficient and its properties, Spearman's Rank correlation. (with and without ties)	05	1, 2
Practical 3	Regression-I		
Content	Concept of linear regression analysis, Fitting of a linear regression line by method of least squares.	05	1,2, 3&4
Practical 4	Regression-II		
Content	Relation between regression coefficients and correlation coefficients, Coefficient of determination.	05	1,2,3
Practical 5	Fitting of curve		
Content	Principle of least squares. fitting of curves reducible to linear form by transformation and fitting of quadratic curve using method of least squares.	05	2,3,4
Practical 6	Time series		
Content	Definition of time series, Components of time series, Models of time series.	05	2,3,4
Practical 7	Estimation of trend-I		
Content	Using Freehand curve method, Method of Semi-Average	05	2,3,5
Practical 8	Estimation of trend-II		
Content	Using Method of least squares (linear and parabolic)	05	1,2,3,4
Practical 9	Estimation of trend-III		
Content	Using Method of least squares (exponential trend).	05	2,3,4
Practical 10	Estimation of seasonal component-I		
Content	Using Method of simple average method.	05	3,4
Practical 11	Estimation of seasonal component-II		
Content	Using Method of moving average method and Using Ratio to trend method	05	3,4
Practical 12	Data Analysis Using Jamovi Software	05	1,2,3 &4

Reference:

1. Gupta and Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, Tenth Edition. (2000)
2. David S.: Elementary Probability, Cambridge University Press, First Edition. (1994)
3. Hogg R.V. and Tannis E.P.: Probability and Statistical Inference, Ninth Edition. (2015)
4. Goon A.M., Gupta M.K., Dasgupta B.: Fundamentals of Statistics, Volume II: The World Press Private Limited, Calcutta.(1968)

Examination:

- Internal evaluation (20 Marks).
- End Semester practical examination (30 Marks).
- 75% attendance in the regular practical with certified journal is compulsory for appearing the practical examination.



Shiromani Gurudwara Prabandhak Committee's

**Guru Nanak Khalsa College of Arts, Science and Commerce
(Autonomous)**

Matunga, Mumbai – 400 019, Maharashtra

Program: Bachelor of Science

Syllabus

Course: FY B.Sc. STATISTICS

Semester II

Skill Enhancement Course (SEC)

Name of the paper: Data Analysis Using Python and MS Excel

(As per NEP guidelines-DSC model)

With effect from Academic Year 2026-2027



Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)
Department of Mathematics and Statistics

Course: F. Y. B. Sc. Statistics Skill Enhancement Course

Semester: II

Course Title: Data Analysis Using Python and MS Excel

Course Code: GNKUSSTASEC102

Credits: 2 (Practical based)

No of Practical Hours: 60

Marks: 50

Sr. No.	Course objectives
The course aims at:	
1	To introduce various Python library like SymPy, NumPy, Jupyter notebook.
2	To illustrate mathematical concept using SymPy.
3	To provide working knowledge of organizing and displaying large amounts and complex data.
4.	Data visualization by creating graphs and charts in MS-Excel and using SymPy in Python.
5.	Data analysis by applying statistical methods in MS-Excel and NumPY.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Use and apply various Python library to do understand mathematical concept.	1,2,3	1,2	R, Ap
CO 2	Apply SymPy to illustrate various mathematical concept.	1,2,3	1,2	Ap, An, E
CO 3	Use various tools in MS-Excel and Python for data visualization.	1,4,5	1,5,6	Ap, An, E
CO 4	Do data analysis using NumPy and MS-Excel.	1,5,6	1,6	C, Ap, An

Skill Enhancement Course

	Title Data Analysis Using Python and MS Excel	Practical hours	CO Mapping
Unit I	Symbolic Python (SymPy)	15 hrs	
1.1	Overview of SymPy, NumPy, pandas, matplotlib, IPython and Jupyter, SciPy, scikit-learn, statsmodels. Symbolic math using the SymPy library. Defining Symbols and Symbolic Operations, factorizing and expanding expressions, Substituting in Values, Converting strings to mathematical expressions	7 hrs	1
1.2	Solving equations, Solving Quadratic equations, Solving for one variable in terms of others, Solving a system of linear equations, Plotting using SymPy, Plotting expressions input by the user, Plotting multiple functions	8 hrs	1 2
Unit II	NumPy basics	15 hrs	
2.1	Creating ndarray, datatypes for ndarray, Arithmetic with NumPy Arrays, Basic Indexing and slicing, Transposing Arrays and Swapping Axes. Finding mean, median, mode, standard deviation, coefficient of variation, correlation coefficients etc.	8 hrs	2 3
2.2	Universal function, Mathematical and statistical function, Linear Algebra, , Finding transpose, determinant, inverse of the matrices, Solving system of linear equations.	7 hrs	4
Unit 3	Statistical Functions and Visualizing Data in MS-Excel	15 hrs	
3.1	Statistical functions: ROUND, ROUNDDOWN, ROUNDUP, CEILING, FLOOR, INT, MAX, MIN, MOD, SQRT, ABS, SUM, COUNT, AVERAGE, MODE, STDEVA, VAR, QUARTILE, COUNTA, COUNTBLANK, CORREL, LARGE, SMALL	5hrs	2 & 3
3.2	Graphical Representation: 1. Frequency distribution of the data. 2. Graphical presentation of data: Histogram, frequency polygon, ogives. 3. Diagrammatic presentation of data: Simple bar diagram, Joint bar diagram, Subdivided bar diagram, pie chart. 4. Create a new chart, add additional data series switch between rows and columns in source data, analyze data using Quick analysis.	10 hrs	2 & 3

	5. Resize charts, add and modify chart elements, apply chart layouts and styles, move charts to a chart sheet		
Unit 4	Summarization and Data Analysis	15 hrs	
4.1	Descriptive Statistics – Measures of Central Tendency, Measures of Dispersion, Computation of co-efficient of Skewness and Kurtosis. Computation of probabilities and cumulative probabilities of Binomial, Poisson and Hypergeometric distribution. Fitting of Binomial, Poisson and Hypergeometric distribution	8 hrs	3 & 4
4.2	1. Correlation and Regression. 2. testing significance difference of mean for large and small sample size.	7 hrs	4

Reference books:

1. Beginner's guide for JavaScript, 3rd Edition, John Pollock
2. Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython, Wes Mckinney, O'Reilly, Second edition
3. Python Data Science Handbook: Essential Tools for Working with Data, Jake VanderPlas, O'Reilly, First Edition.
4. Doing math with Python, Amit Saha.
5. Statistical Analysis with Excel for Dummies, Wiley Publications, Joseph Schmuller.
6. Straightforward Statistics with Excel, Second Edition, C. Bowen.
7. Statistical Fundamentals: Using Microsoft Excel for Univariate and Bivariate Analysis, Rovai A.P.

Examination:

- **Internal evaluation (20 Marks).**
- **End Semester practical examination (30 Marks).**
- **75% attendance in the regular practical with certified journal is compulsory for appearing the practical examination.**

Course Outcomes

Bloom's Taxonomy categorizes educational objectives into six cognitive levels, listed from the simplest to the most complex.

The course outcomes (CO) are mapped to the revised Bloom's Taxonomy using the following Cognitive levels along with abbreviations: **Remembering-R, Understanding-U, Applying-Ap, Analyzing-An, Evaluating-E, Creating-C.**

R-Remembering: This level involves recalling facts, terms, basic concepts, and answers without necessarily understanding the meaning or implications.

U-Understanding: Understanding involves explaining ideas or concepts and interpreting them in one's own words to demonstrate comprehension.

Ap-Appling: Applying knowledge involves using acquired knowledge in new situations or applying it in different ways.

An-Analyzing: Analyzing involves breaking down information into parts to understand its organizational structure, recognizing patterns, and identifying relationships between components.

E-Evaluating: Evaluating involves making judgments based on criteria and standards, assessing the value of theories, presentations, or materials.

C-Creating: Creating involves putting elements together to form a coherent or functional whole, reorganizing elements into a new pattern or structure.

Use the following action verbs for Blooms taxonomy levels to prepare Course outcomes:

No	Levels	Action verbs
1	Remember	Choose, Describe, Define, Label List, Locate,, Match, Memorize, Name, Omit, Recite, Select, State, Count, Draw, Outline, Point, Quote, Recall, Recognize, Repeat, Reproduce, Recall, Arrange, Duplicate, Tabulate.
2	Understand	Restate ,Discuss, Clarify, Locate, Recognise, Classify, Translate, Explain, Express, Review, Interpret, Select, Summarise, Contrast, Predict, Associate, Estimate, Extend
3	Apply	Demonstrate, Schedule, Operate, Dramatize, Apply, Employ, Use, Practise, Illustrate, Choose, Solve, Write, Calculate, Complete, Show, Examine, Modify, Relate, Classify, Experiment.
4	Analyse	Distinguish, Differentiate, Investigate, Categorise, Appraise, Inspect, Test, Debate, Compare, Contrast, Question
5	Evaluate	Judge, Score, Select, Evaluate, Choose, Rate, Assess, Compare, Estimate, Value, Measure, Discriminate, Argue, Defend, Support, Conclude, Summarize, Appraise, Revise.
6	Create	Compose, Assemble, Organise, Plan, Collect, Propose, Construct, Design, Create, Formulate, Arrange, Devise, Modify, Derive, Develop, Integrate, Rearrange, Substitute, Invent, Generalise.