MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

DEPARTMENT OF MATHEMATICS AND STATISTICS

Bachelor of Science/ Arts (B.Sc./B.A.) 2023-24

Faculty : SCIENCE

Subject : STATISTICS

Semester : First

Level	Semester	Course Type	Course Code	Title	Delivery Type			Total Hours	Credit	Total Credit	Internal Assessment	EoS Exam	M. M.	Remarks
					L	T	P							
5	I	DCC	STA5000T	Statistics-I: Descriptive Statistics	L	-	-	60	4	6	20	80	100	---
			STA5000P	Statistics Lab-I: Practical based on STA5000T	-	-	P	60	2		20	80	100	---

SEMESTER I B.Sc. (Three Year Degree Program) 2023-24

Code of the Course	**: STA5000T**
Title of the Course	**: Descriptive Statistics**
Level of the Course	**: NHEQF Level 4.5**
Credit of the Course	**: 4**
Type of the Course	**: Discipline Centric Compulsory (DCC)**
Delivery type of the Course	**: Lecture** (40 Hours for content delivery and 20 Hours for subject/ class activity, problem solving, diagnostic assessment and formative assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to strengthen the basic knowledge of Statistics and lay foundation for further learning of the subject through first course on Descriptive Statistics which is a prerequisite for higher courses in Statistics.

Course Learning Outcomes:

- The fundamental knowledge of basic concept of statistics, population, sample, types of data, method to collect them, scales of measurement, construction of frequency tables and classifications of frequency data.
- Ability to visualize the data diagrammatically and graphically.
- The knowledge to analyse and interpret various measure of central tendency, dispersion, skewness and kurtosis.
- To learn about independence, consistency and association of attributes
- To learn the concepts of bivariate data, Correlation & regression and their properties.
- Also able to fit different types of polynomials and exponential curves.

Syllabus:

UNIT-I

Definition of Statistics: Importance and scope, Basic concepts of statistical population and sample, Methods of collection and storage of data, Types of data (quantitative and qualitative data), Scales of measurement (nominal, ordinal interval and ratio), Importance of data quality. Construction of frequency tables for grouped and ungrouped data, Classification and tabulation, Discrete and continuous classification, no. of classes and class limits. (12 Hours)

UNIT-II

Representation of Statistical data: Diagrammatically and graphically representation of statistical data, Pie, Bar, Multiple bar chart, Stem and leaf plot, Histograms, Frequency polygon, Frequency curve, Ogives curve, Time plot. (12 Hours)

UNIT-III

Measures of Central Tendency: Mathematical and positional averages, Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Lorenz curve, Moments, absolute moments, factorial moments, Skewness and kurtosis, Sheppard's corrections. (12 Hours)

UNIT-IV

Theory of Attributes: Class frequencies and their order (up to three attributes only), consistency of data, Association and independence of data, Yule's coefficient of association and coefficient of colligation. (12 Hours)

UNIT-V

Correlation & Regression: Bivariate data, Definition, Scatter diagram, Karl Pearson's coefficient of correlation, Spearman's rank correlation. Principle of least squares and fitting of polynomials and exponential curves, lines of regression, properties of regression coefficient, angle between two regression lines and residual variance. (12 Hours)

Suggested Books and References:

1. Gupta S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
2. Kapur, J.N and Saxena, H.C. : Mathematical Statistics, S.Chand& Company Ltd., New Delhi.
3. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8thEd. The World Press, Kolkata.
4. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
5. Nagar, K. N.: Fundamentals of Statistics (Hindi edition) Meenakshi Prakashan, Meerut.
6. Singh S.P.: Statistics'.

SEMESTER I B.Sc. (Three Year Degree Program) 2023-24

Code of the Course : **STA5000P**

Title of the Course : **Practical Based on DCC-STA5000T**

Level of the Course : **NHEQF Level 4.5**

Credit of the Course : **2**

Type of the Course : **Discipline Centric Compulsory (DCC)**

Delivery type of the Course : **Practical** (40 Hours for Hands-on software and problem solving + 20 Hours for assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to strengthen the practical knowledge of Statistics to interpret and analyze the statistical data.

Course Learning Outcomes:

After hands-on MS Excel students will learn:

- Presentation of raw data.
- Graphical presentation of frequency polygon, curve and ogives.
- Diagrammatic representation of Bars and Diagram.
- Measure of central tendency.
- Measure of dispersion.
- Moments and measures of skewness and Kurtosis.
- Association of attributes.
- Correlation between variables and attributes
- Regression lines and coefficients.

Syllabus:

List of Practical (hands-on with MS Excel) (60 Hours)

1. Presentation of raw data.
2. Graphical representation by (I) Histogram (ii) Frequency polygon (iii) Frequency curve and (iv) Ogives.
3. Diagrammatic representation by (i) Bars (ii) Pie diagram.
4. Measures of Central Tendency: Mean, Median, Mode, G.M., H.M., Quartiles, Deciles & Percentiles.
5. Measures of Dispersion (i) Range (ii) Semi interquartile range (iii) Mean Deviation (iv) Standard Deviation and Variance (v) Coefficient of Variation (vi) Lorenz Curve.
6. Moments and various measures of Skewness and Kurtosis.
7. Determination of class frequencies, consistency of data and association of attributes.
8. Fitting of polynomials.
9. Fitting of exponential curves, power curves.
10. Karl Pearson correlation coefficient.
11. Correlation coefficient for a bivariate frequency distribution.
12. Lines of regression, angle between lines and estimated values of variables.
13. Rank correlation.

Suggested Books and References:

1. Gupta S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
2. Kapur, J.N and Saxena, H.C. : Mathematical Statistics, S.Chand & Company Ltd., New Delhi.
3. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8thEd. The World Press, Kolkata.
4. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
5. Nagar, K. N.: Fundamentals of Statistics (Hindi edition) Meenakshi Prakashan, Meerut.
6. Singh S.P.: Statistics.
7. Gupta, B. N.: Statistics: Theory & Practice (Hindi & English editions), Sahitya Bhawan, Agra.

MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

DEPARTMENT OF MATHEMATICS AND STATISTICS

Bachelor of Science/ Arts (B.Sc./B.A.) 2023-24

Faculty : SCIENCE

Subject : STATISTICS

Semester : Second

Level	Semester	Course Type	Course Code	Title	Delivery Type			Total Hours	Credit	Total Credit	Internal Assessment	EoS Exam	M. M.	Remarks
					L	T	P							
5	II	DCC	STA5001T	Statistics-II: Probability Theory	**L**	-	-	60	4	6	20	80	100	---
			STA5001P	Statistics Lab -II: Practical based on STA5001T	-	-	**P**	60	2		20	80	100	---

SEMESTER II B.Sc. (Three Year Degree Program) 2023-24

Code of the Course	**: STA5001T**
Title of the Course	**: Probability Theory**
Level of the Course	**: NHEQF Level 4.5**
Credit of the Course	**: 4**
Type of the Course	**: Discipline Centric Compulsory (DCC)**
Delivery type of the Course	**: Lecture** (40 Hours for content delivery and 20 Hours for subject/ class activity, problem solving, diagnostic assessment and formative assessment

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to introduce the basic concepts of Probability theory and lay foundation for further learning of the subject which leads the base for the advance study in Statistics.

Course Learning Outcomes:

- Fundamentals of probability theory, its definition addition law of probability and simple problem of probability.
- Knowledge to apply conditional and multiplication law of probability and simple applications.
- Types of random variable their probability mass function and density functions.
- Mathematical expectation its definition, additive and multiplicative law and elementary idea of conditional expectation etc.
- Moments and cumulant generating function and their properties.

Syllabus:

UNIT - I

Random experiment, sample space, Events, Union and Intersection of events, mutually exclusive, exhaustive, independent and equally likely events, Classical and Statistical definitions of probability and simple problems, Axiomatic approach to probability, Addition law of probability for two or more event. (16 Hours)

UNIT -II

Conditional probability, Multiplication law of probability, Statistical independence of events, Pairwise mutual independence, Bayes theorem and its simple applications. (12 Hours)

UNIT - III

Random Variable: Discrete and continuous random variables, Probability mass and density functions, joint, marginal and conditional probability functions, Distribution functions and their properties. (12 Hours)

UNIT -IV

Mathematical Expectation Definition of expectation, Addition and Multiplication laws of expectation, Moments in terms of expectation, variance and covariance for the linear combination of random variables, Elementary idea of conditional expectation, Schwartz's inequality. (12 Hours)

UNIT - V

Moment generating and Cumulant generating functions with their properties, Characteristic function with properties (without proof). (8 Hours)

Suggested Books and References:

1. Gupta S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics,2nd Edn. (Reprint) John Wiley and Sons.
3. Kapur, J.N and Saxena, H.C. : Mathematical Statistics, S.Chand & Company Ltd., New Delhi.
4. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8th Ed. The World Press, Kolkata.
5. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Ed., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
6. David, R. (1996) Elementary Probability, Oxford Press.

SEMESTER II B.Sc. (Three Year Degree Program) 2023-24

Code of the Course	**: STA5001P**
Title of the Course	**: Practical Based on DCC-STA5002T**
Level of the Course	**: NHEQF Level 4.5**
Credit of the Course	**: 2**
Type of the Course	**: Discipline Centric Compulsory (DCC)**
Delivery type of the Course	**: Practical** (40 Hours for Hands-on software and problem solving + 20 Hours for assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to strengthen the practical knowledge of Probability theory to solve the problems based on probabilities.

Course Learning Outcomes:

After hands-on MS Excel students will able to solve the problem of

- Permutation & Combination.
- Addition and multiplication theorems
- Conditional probability and Bayes Theorem.
- Probability mass function, Joint, marginal and conditional function.
- Mathematical expectation, moment generating function and cumulant generating function.

Syllabus:

List of Practical (hands-on with MS Excel) (60 Hours)

1. Permutation & Combination.
2. Evaluation of probabilities using addition and multiplication theorems
3. Conditional probability and Bayes Theorem.
4. Probability mass function, Joint, marginal and conditional function.
5. Mathematical expectation, moment generating function and cumulant generating function.

Suggested Books and References:

1. Gupta S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics,2nd Edn. (Reprint) John Wiley and Sons.
3. Kapur, J.N and Saxena, H.C. : Mathematical Statistics, S.Chand & Company Ltd., New Delhi.
4. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8th Ed. The World Press, Kolkata.
5. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Ed., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
6. David, R. (1996) Elementary Probability, Oxford Press.

MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

DEPARTMENT OF MATHEMATICS AND STATISTICS

Bachelor of Science/ Arts (B.Sc./B.A.) 2024-25

Faculty : SCIENCE

Subject : STATISTICS

Semester : Third

Level	Semester	Course Type	Course Code	Title	Delivery Type			Total Hours	Credit	Total Credit	Internal Assessment	EoS Exam	M. M.	Remarks
					L	T	P							
6	III	DCC	STA6000T	Statistics-III: Probability Distributions	**L**	-	-	60	4	6	20	80	100	---
			STA6000P	Statistics Lab -III: Practical based on STA6000T	-	-	**P**	60	2		20	80	100	---

SEMESTER III B.Sc. (Three Year Degree Program) 2024-25

Code of the Course	**: STA6000T**
Title of the Course	**: Probability Distributions**
Level of the Course	**: NHEQF Level 5**
Credit of the Course	**: 4**
Type of the Course	**: Discipline Centric Compulsory (DCC)**
Delivery type of the Course	**: Lecture** (40 Hours for content delivery and 20 Hours for subject/ class activity, problem solving, diagnostic assessment and formative assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to familiarize with distributions of probabilities which lead to the base for further learning of the application of statistics subjects which are a prerequisite for higher courses in Statistics.

Course Learning Outcomes:

- Weak law of large numbers and central limit theorem for i.i.d. random variables.
- Univariate discrete distributions their properties and application.
- Univariate continuous distributions their properties and application.

Syllabus:

UNIT I

Chebyshev's inequality, Weak law of large numbers, Central limit theorem for i.i.d. random variables and simple problems on them. (12 Hours)

UNIT II

Univariate Discrete Probability Distributions: Bernoulli, Binomial and Poisson distributions with their derivations, properties and simple applications, Fitting of Binomial and Poisson distributions. (12 Hours)

UNIT III

Negative Binomial distribution, Hypergeometric distributions with their derivations, Properties and simple applications, Elementary idea of Geometric and Multinomial distributions. (12 Hours)

UNIT IV

Univariate Continuous Probability Distributions: Rectangular, Normal and Cauchy distributions, with their derivations, properties and simple applications, fitting of normal distribution. (12 Hours)

UNIT V

Exponential, Beta type I, Beta type II and Gamma distributions with their derivations, properties and simple applications. (12 Hours)

Suggested Books and References:

1. Gupta S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics,2nd Edn. (Reprint) John Wiley and Sons.
3. Kapur, J.N and Saxena, H.C. : Mathematical Statistics, S.Chand & Company Ltd., New Delhi.
4. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8th Ed. The World Press, Kolkata.
5. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Ed., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.

SEMESTER III B.Sc. (Three Year Degree Program) 2024-25

Code of the Course	**: STA6000P**
Title of the Course	**: Practical Based on STA6000T**
Level of the Course	**: NHEQF Level 5**
Credit of the Course	**: 2**
Type of the Course	**: Discipline Centric Compulsory (DCC)**
Delivery type of the Course	**: Practical** (40 Hours for Hands-on software and problem solving + 20 Hours for assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to introduce the practical application of Probability Distributions.

Course Learning Outcomes:

After hands-on MS Excel students will able to learn

- Fitting of (i) Binomial distribution (ii) Poisson (iii) Negative Binomial distribution.
- Fitting of Normal distribution.
- Area property of Normal distribution.

Syllabus:

List of Practical (hands-on with MS Excel) (60 Hours)

1. Fitting of (i) Binomial distribution (ii) Poisson (iii) Negative Binomial distribution.
2. Fitting of Normal distribution.
3. Area property of Normal distribution.

Suggested Books and References:

1. Gupta S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics,2nd Edn. (Reprint) John Wiley and Sons.
3. Kapur, J.N and Saxena, H.C. : Mathematical Statistics, S.Chand & Company Ltd., New Delhi.
4. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8th Ed. The World Press, Kolkata.
5. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Ed., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
6. David, R. (1996) Elementary Probability, Oxford Press.

MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

DEPARTMENT OF MATHEMATICS AND STATISTICS

Bachelor of Science/ Arts (B.Sc./B.A.) 2024-25

Faculty : SCIENCE

Subject : STATISTICS

Semester : Fourth

Level	Semester	Course Type	Course Code	Title	Delivery Type			Total Hours	Credit	Total Credit	Internal Assessment	EoS Exam	M. M.	Remarks
					L	T	P							
6	IV	DCC	STA6001T	Statistics-IV: Sampling Distributions & Official Statistics	L	-	-	60	4	6	20	80	100	---
			STA6001P	Statistics Lab - IV: Practical based on STA6001T	-	-	P	60	2		20	80	100	---
		SEC	SES6365T	Time Series & Index Number	L	-	-	30	2	2	20	80	100	---

SEMESTER IV B.Sc. (Three Year Degree Program) 2024-25

Code of the Course	**: STA6001T**
Title of the Course	**: Sampling Distributions & Official Statistics**
Level of the Course	**: NHEQF Level 5**
Credit of the Course	**: 4**
Type of the Course	**: Discipline Centric Compulsory (DCC)**
Delivery type of the Course	**: Lecture** (40 Hours for content delivery and 20 Hours for subject/ class activity, problem solving, diagnostic assessment and formative assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to introduce Sampling distributions their requirement and Official Statistics in Statistics.

Course Learning Outcomes:

- Univariate sampling distribution its concept, properties and concepts of standard error of an estimate.
- Chi-square distribution its derivation, properties and problems.
- t distribution its derivation and properties
- F and Z sampling distribution with their properties
- Statistical organization of India, its functions and publication.

Syllabus:

UNIT-1

Univariate Sampling Distributions: Concept of random sampling, parameter and statistic, sampling distribution of a statistic, sampling distribution of sample means, Concept of standard error sample mean, sample variance and proportion, Null and alternative hypothesis, level of significance, Type I and Type II errors, their probabilities and critical region. (12 Hours)

UNIT-II

Large sample tests for testing single proportion, difference of two proportions, single mean, difference of two means, standard deviation and difference of standard deviations by classical and p-value approaches and its application Chi-square distribution its derivation, properties. (12 Hours)

UNIT-III

Exact sampling distributions: Student's and Fishers t distribution its derivation and properties. (12 Hours)

UNIT-IV

Snedecor's F distribution its derivations and properties, Distribution of $1/F(n_1,n_2)$, Relationship between t, F, Z and $\chi 2$ distribution. (12 Hours)

UNIT-V

Present official statistical system in India, Methods of collection of official statistics, their reliability and limitations, Role of Ministry of Statistics & Program Implementation (MoSPI), Central Statistical Office (CSO), National Sample Survey Office (NSSO), and National Statistical Commission, Government of India's Principal publications containing data on the topics such as population, industry and finance. (12 Hours)

Suggested Books and References:

1. Gupta S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
2. Kapur, J.N and Saxena, H.C. : Mathematical Statistics,. S.Chand & Company Ltd., New Delhi.
3. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8thEd. The World Press, Kolkata.
4. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Ed., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
5. M.K. and Das Gupta, B. (1991): Fundamentals of Statistics Vol. I & II World Press, 098 Calcutta.
6. Guide to current Indian Official Statistics, Central Statistical Office, GOI, New Delhi.

7. Saluja, M. R.: Indian Official Statistical Systems, Statistical Publishing society, Calcutta.
8. http://mospi.nic.in/

SEMESTER IV B.Sc. (Three Year Degree Program) 2024-25

Code of the Course	**: STA6001P**
Title of the Course	**: Practical Based on DCC - STA6001T**
Level of the Course	**: NHEQF Level 5**
Credit of the Course	**: 2**
Type of the Course	**: Discipline Centric Compulsory (DCC)**
Delivery type of the Course	**: Practical** (40 Hours for Hands-on software and problem solving + 20 Hours for assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to applying sampling distributions and solve problems based on it.

Course Learning Outcomes:

After hands-on MS Excel students will able to find

- Standard error of estimates for statistics.
- Critical region and size and power of the test statistics.
- Testing of hypothesis for large samples for attributes.
- Testing of hypothesis for large samples for variables.
- Distributions and types of curve of t, F and Chi-square.

Syllabus:

List of Practical (hands-on with MS Excel) (60 Hours)

1. Standard error of estimate of sample means and sample proportion.
2. Critical region and types of errors.
3. Large sample test for simple mean and proportion for attributes.
4. Large sample test for simple mean and proportion for variables.
5. Different measures, distributions and types of curve of t, F and Chi-square distribution.

Suggested Books and References:

1. Gupta S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Kapur, J.N and Saxena, H.C.: Mathematical Statistics,. S.Chand & Company Ltd., New Delhi.
3. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8thEd. The World Press, Kolkata.
4. M.K. and Das Gupta, B. (1991): Fundamentals of Statistics Vol. I & II World Press, 098

SEMESTER IV B.Sc. (Three Year Degree Program) 2024-25

Code of the Course	**: SES6365T**
Title of the Course	**: Time Series & Index Number**
Level of the Course	**: NHEQF Level 5**
Credit of the Course	**: 2**
Type of the Course	**: Skill Enhancement Course (SEC)**
Delivery type of the Course	**: Lecture** (20 Hours for content delivery and 10 Hours for subject/ class activity, problem solving, diagnostic assessment and formative assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to introduce Time series and Index Number for prediction of future events.

Course Learning Outcomes:

- Different components of time series and different method to obtain it.
- Construction of Index numbers types of it and requisites of an ideal index number.
- Solution of problems based on the Time series and Index number.

Syllabus:

UNIT-I

Time Series: Introduction to times series data, application of time series from various fields, Components of a times series, Decomposition of time series. Trend: Estimation of trend by free hand curve method, method of semi averages, fitting a various mathematical curve, and growth curves. (7 Hours)

UNIT-II

Estimation of trend by method of moving averages, De-trending, Effect of elimination of trend on other components of the time series, Estimation of seasonal component by method of simple averages, Ratio to Trend method, Ratio to Moving Averages and Link Relative method. (7 Hours)

UNIT-III

Index Numbers: Problems involved in the construction of Index numbers, types of index numbers, construction of index numbers by aggregate methods and price relative methods, chain indices. (6 Hours)

UNIT-IV

Requisites of an ideal index number, Uses and limitation of the index numbers, Errors in index numbers, Base shifting, splicing and deflating concepts, cost of living and wholesale price index numbers. (5 Hours)

UNIT-V

Solution of Numerical Problems based on Time series and Index number. (5 Hours)

Suggested Books and References:

1. Gupta S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. Kapur, J.N. and Saxena, H.C.: Mathematical Statistics, S. Chand & Company Ltd., New Delhi.
3. Kendall, M.G. (1976): Time Series, Charles Griffin.
4. Chatfield, C. (1980): The Analysis of Time Series –An Introduction, Chapman & Hall.
5. Das, M.K. and Gupta B.(1991): Fundamental of Statistics Vol. I & II World Press, Calcutta.
6. Mukhopadhyay, P. (2011): Applied Statistics, 2nd ed. Revised reprint, Books and Allied.

MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

DEPARTMENT OF MATHEMATICS AND STATISTICS

Bachelor of Science/ Arts (B.Sc./B.A.) 2025-26

Faculty : SCIENCE

Subject : STATISTICS

Semester : Fifth

Level	Semester	Course Type	Course Code	Title	Delivery Type			Total Hours	Credit	Total Credit	Internal Assessment	EoS Exam	M. M.	Remarks
					L	T	P							
7	V	DSE	STA7100T	Statistical Inference	**L**	-	-	60	4	6	20	80	100	---
			STA7100P	Elective Statistics Lab-I: Practical based on STA7100T	-	-	**P**	60	2		20	80	100	---
			STA7101T	Theory of Sample Surveys & SQC	**L**	-	-	60	4	6	20	80	100	---
			STA7101P	Elective Statistics Lab–II: Practical based on STA7101T	-	-	**P**	60	2		20	80	100	---
		SEC	SES7365T	Numerical Analysis	**L**	-	-	30	2	2	20	80	100	---

SEMESTER V B.Sc. (Three Year Degree Program) 2025-26

Code of the Course	**: STA7100T**
Title of the Course	**: Statistical Inference**
Level of the Course	**: NHEQF Level 5.5**
Credit of the Course	**: 4**
Type of the Course	**: Discipline Specific Elective (DSE)**
Delivery type of the Course	**: Lecture** (40 Hours for content delivery and 20 Hours for subject/ class activity, problem solving, diagnostic assessment and formative assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to introduce the basic concepts of estimation theory and testing of hypothesis which is prerequisites for analytical study of testing statistical application.

Course Learning Outcomes:

- Concepts of Point estimation with their properties.
- Concepts of Interval Estimation.
- Procedure of testing hypothesis its terminology and determination of BCR for testing simple v/s simple hypothesis in uniform and normal population.
- Application of test of significance for Chi-square distribution, t-distribution and F-distribution.
- Concepts of Sequential Analysis and elements of decision theory.

Syllabus:

UNIT- I

Point Estimation: Bias, Mean Square error, variance and relation among them of an estimator, Concept of point estimation, properties of point estimators such as consistency, Unbiasedness, efficiency and simple notion of sufficiency, Factorization theorem (without proof), Minimum variance unbiased estimator and its properties (excluding, Cramer-Rao inequality) and problems on them. (16 Hours)

UNIT-II

Interval Estimation: Concept of interval estimation, confidence interval and confidence coefficient, Confidence interval for mean and variance in case of normal population. (8 Hours)

UNIT-III

Testing of Hypothesis: Simple and composite hypothesis, size of critical region, level of significance, Power of the test, Power curves in simple cases, critical region and best critical region (BCR), Most powerful and uniformly most powerful tests, Neyman-Pearson's Lemma, Determination of B.C.R for testing simple v/s simple hypothesis in uniform and normal populations. (12 Hours)

UNIT-IV

Tests of significance based on Chi-square distribution, Test of significance based on t distribution, Test of significance based on F-distribution. (12 Hours)

UNIT-V

Methods of estimation: Method of moments, Method of least squares and Method of maximum likelihood estimation with their properties (without proof).

Elements of Sequential Analysis, Construction of sequential probability ratio tests (SPRT), O.C. and A.S.N. functions, Applications of SPRT for testing simple v/s simple hypothesis in case of Bernoulli and Normal populations. (12 Hours)

Suggested Books and References:

1. Gupta S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
2. Kapur, J.N and Saxena, H.C. : Mathematical Statistics,. S.Chand & Company Ltd., New Delhi.
3. Singh J.: Statistical Inference (Hindi Edition), Madhya Pradesh Hindi Granth Academy, Bhopal.
4. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8thEd. The World Press, Kolkata.
5. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
6. Rohatgi, V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics, 2ndEdn. (Reprint) John Wiley and Sons.
7. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Ed., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.

SEMESTER V B.Sc. (Three Year Degree Program) 2025-26

Code of the Course	**: STA7100P**
Title of the Course	**: Practical Based on DSE – STA7100T**
Level of the Course	**: NHEQF Level 5.5**
Credit of the Course	**: 2**
Type of the Course	**: Discipline Specific Elective (DSE)**
Delivery type of the Course	**: Practical** (40 Hours for Hands-on software and problem solving + 20 Hours for assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to applying appropriate test of significance to analyses data set in application of Statistical hypothesis.

Course Learning Outcomes:

After hands-on MS Excel students will able to learn:

- Testing of significance and confidence intervals for attributes.
- Testing of significance and confidence intervals for variables.
- Application of tests based on Chi-Square distribution.
- Application of test of significance for t- distribution.
- Application of test of significance for F- distribution.

Syllabus:

List of Practical (hands-on with MS Excel) (60 Hours)

1. Testing of significance and confidence intervals for single proportion
2. Testing of significance and confidence intervals difference of two proportions
3. Testing of significance and confidence intervals for single mean
4. Testing of significance and confidence intervals difference of two means
5. Testing of significance for paired samples.
6. Testing of significance and confidence intervals for difference of two standard deviations.
7. Exact Sample Tests based on Chi-Square Distribution.
8. Testing if the population variance has a specific value and its confidence intervals.
9. Testing of goodness of fit.
10. Testing of independence of attributes.
11. Testing based on 2 X 2 contingency table without and with Yates' corrections.
12. Testing of significance and confidence intervals of an observed sample correlation coefficient.
13. Testing and confidence intervals of equality of two population variances.

Suggested Books and References:

1. Gupta,S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Kapur, J.N and Saxena, H.C. : Mathematical Statistics, S.Chand & Company Ltd., New Delhi.
3. Singh, J.: Statistical Inference (Hindi Edition), Madhya Pradesh Hindi Granth Academy, Bhopal.
4. Goon, A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8thEd. The World Press, Kolkata.
5. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
6. Rohatgi, V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics, 2ndEdn. (Reprint) John Wiley and Sons.
7. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Ed., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.

SEMESTER V B.Sc. (Three Year Degree Program) 2025-26

Code of the Course	**: STA7101T**
Title of the Course	**: Theory of Sample Survey & Statistical Quality Control (SQC)**
Level of the Course	**: NHEQF Level 5.5**
Credit of the Course	**: 4**
Type of the Course	**: Discipline Specific Elective (DSE)**
Delivery type of the Course	**: Lecture** (40 Hours for content delivery and 20 Hours for subject/ class activity, problem solving, diagnostic assessment and formative assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to strengthen the basic concepts of sample surveys and statistical quality control and lay foundation for further learning of the subject.

Course Learning Outcomes:

- Concepts of sample surveys principle steps in a sample survey, its limitations. Principle of sampling design and procedure of selecting random samples.
- Simple random sampling With replacement and Without replacement.
- Stratified random sampling Systematic Sampling, Cluster and two stage sampling their definition and estimation of mean and variance.
- Systematic Sampling, Cluster and two stage sampling their definition and estimation of mean and variance.
- Control charts for variables & Attributes, O.C. & A.S.N. function.

Syllabus:

UNIT-I

Concepts of population and sample, need for sampling. The principle steps in a sample survey, concept of sampling and non-sampling errors, Advantages of sample survey over complete enumeration, Limitations of sampling, types of sampling, basic principles of sampling design, procedures of selecting a random sample. (12 Hours)

UNIT-II

Simple random sampling with and without replacement for variables and attributes. (8 Hours)

UNIT-III

Stratified random sampling including allocation problems, Efficiency with SRS including intra class correlation coefficient (Excluding cost function). (12 Hours)

UNIT-IV

Systematic sampling, estimation of mean and its variance, comparison with SRS and stratified random sampling for a linear trend population, Cluster Sampling (with equal cluster size): Definition, Estimation of mean and its variance, Two-stage sampling (with equal cluster size) Definition, Estimation of mean and variance. (12 Hours)

UNIT-V

Statistical Quality Control: Process control and Product control, Control charts, 3a-control limits, Tools for SQC, Control charts for variables and attributes, $\overline{X}$ and R charts, $\overline{X}$ and S charts, p, np and c-charts, Criterion for detecting lack of control in various charts, Natural tolerance and specification limits, Modified control limits, Principles of Acceptance Sampling Problem of lot acceptance, good and bad lots, producer's & Consumer's risk, single & double sampling plans and their O.C. functions, Concepts of AQL, LTPD and AOQL Average amount of Inspection and ASN functions. (16 Hours)

Suggested Books and References:

1. Gupta S.C. and Kapoor V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. Goon A.M., Gupta M.K. and Das Gupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8thEd. The World Press, Kolkata.
3. Cochran W.G.: Sampling Techniques (Hindi & English Edition), Kendriya Hindi Granth Academy, New Delhi (English Ed.).
4. Mukhopadhyay P.* (1998): Theory and methods of Survey Sampling, Prentice Hall.
5. Sampat, S. (2000): Sampling Theory (Narosa).
6. Sukhatme, P.V., Sukhatme, B.V., Sukhatme, S. and Ashok C.: Sampling theory of Surveys, and Applications, Indian Society of Agricultural Statistics, New Delhi.

SEMESTER V B.Sc. (Three Year Degree Program) 2025-26

Code of the Course	**: STA7101P**
Title of the Course	**: Practical Based on DSE – STA7101T**
Level of the Course	**: NHEQF Level 5.5**
Credit of the Course	**: 2**
Type of the Course	**: Discipline Specific Elective (DSE)**
Delivery type of the Course	**: Practical** (40 Hours for Hands-on software and problem solving + 20 Hours for assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to gain the practical knowledge of Sample Surveys and Statistical Quality Control to solve the problems based on probabilities.

Course Learning Outcomes:

After hands-on MS Excel students will able to solve Sample surveys problems for:

- Simple Random Sampling with & without replacement.
- Stratified random sampling.
- Systematic sampling, Cluster and Two stage sampling their definition and estimation of mean and variance.
- Statistical quality control with different charts for variables and attributes.
- Principles of acceptance of sampling plan and their functions.

Syllabus:

List of Practical (hands-on with MS Excel) (60 Hours)

1. To select Simple Random Sampling with and without replacement.
2. For a population of size 5, estimate population mean, population mean square and population variance. Enumerate all possible samples of size 2 by WR and WOR.
3. For SRSWOR, estimate mean, standard error and sample size
4. Stratified Sampling: allocation of sample to strata by proportional and Neyman's methods Compare the efficiencies of above two methods relative to SRS
5. Estimation of gain in precision in stratified sampling.
6. Comparison of systematic sampling with stratified sampling and SRS in the presence of a linear trend.
7. Cluster sampling, estimation of mean or total, variance of the estimate as compared to SRS
8. Statistical Quality Control charts for variables and attributes and O.C. & A.S.N. function.

Suggested Books and References:

1. Gupta S.C. and Kapoor V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8thEd. The World Press, Kolkata.
3. Cochran W.G.: Sampling Techniques (Hindi & English Edition), Kendriya Hindi Granth Academy, New Delhi (English Ed.).
4. Mukhopadhyay P.* (1998): Theory and methods of Survey Sampling, Prentice Hall.
5. Sampat, S. (2000): Sampling Theory (Narosa).
6. Sukhatme, P.V., Sukhatme, B.V., Sukhatme, S. and Ashok C.: Sampling theory of Surveys, and Applications, Indian Society of Agricultural Statistics, New Delhi.

SEMESTER V B.Sc. (Three Year Degree Program) 2025-26

Code of the Course	**: SES7365T**
Title of the Course	**: Numerical Analysis**
Level of the Course	**: NHEQF Level 4.5**
Credit of the Course	**: 2**
Type of the Course	**: Skill Enhancement Course (SEC)**
Delivery type of the Course	**: Lecture** (20 Hours for content delivery and 10 Hours for subject/ class activity, problem solving, diagnostic assessment and formative assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to strengthen the theoretical, conceptual and analytical aspects of the use of numerical methods.

Course Learning Outcomes:

- Study the interpolation methods & operators for equal unequal intervals.
- Discuses the numerical integration forward & backword methods for equal intervals.
- Divided interpolation formula and inverse interpolation formula.
- Numerical integration using different methods.
- Problems based on above methods.

Syllabus:

UNIT- I

Theory of Finite Differences: Operator, Δ , E & ∇ with their properties, Problems of identities involving Δ & E & ∇. (6 Hours)

UNIT-II

Factorial function: Newton-Gregory's forward and backward interpolation formulae, Estimation of missing value in equal intervals. (6 Hours)

UNIT- III

Theory of divided differences and its properties, Newton's divided difference & Lagrange's interpolation formulae, inverse interpolation by making use of Lagrange's formula. (6 Hours)

UNIT-IV

Numerical Integration: Trapezoidal rule, Simpson's 1/3 & 3/8th rule, Weddle's rule and related problems. (6 Hours)

UNIT-V

Numerical Problems based on above topics. (6 Hours)

Suggested Books and References:

1. Saxena H.C.: Numerical Analysis, Pragati Prakashan, S. Chand & Company Ltd., New Delhi.
2. Goyal,Mittal: Numerical Analysis, Pragati Prakashan, Meerut.
3. Gokhroo D. & Saini S.R.

MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

DEPARTMENT OF MATHEMATICS AND STATISTICS

Bachelor of Science/ Arts (B.Sc./B.A.) 2025-26

Faculty : SCIENCE

Subject : STATISTICS

Semester : Sixth

Level	Semester	Course Type	Course Code	Title	Delivery Type			Total Hours	Credit	Total Credit	Internal Assessment	EoS Exam	M. M.	Remarks
					L	T	P							
7	VI	DSE	STA7102T	Design of Experiments & Vital Statistics	**L**	-	-	60	4	6	20	80	100	---
			STA7102P	Elective Statistics Lab –III: Practical based on STA7102T	-	-	**P**	60	2		20	80	100	---
		DSE	STA7103T	Project/ Dissertation	-	-	6	135	3+3	6	20	80	100	Presentation, submission and viva voice
		SEC	SES7366P	Data Analysis using SPSS	-	-	P	60	2	2	20	80	100	---

SEMESTER VI B.Sc. (Three Year Degree Program) 2025-26

Code of the Course	**: STA7102T**
Title of the Course	**: Design of Experiments & Vital Statistics**
Level of the Course	**: NHEQF Level 5.5**
Credit of the Course	**: 4**
Type of the Course	**: Discipline Specific Elective (DSE)**
Delivery type of the Course	**: Lecture** (40 Hours for content delivery and 20 Hours for subject/ class activity, problem solving, diagnostic assessment and formative assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to introduce Design of Experiments and Vital Statistics which is prerequisites of agricultural experimentation and demography respectively.

Course Learning Outcomes:

- ANOVA for one-way and two-way classification, Basic concepts, models and its types in design of experiments.
- ANOVA for CRD & RBD and its efficiency.
- ANOVA for LSD, Missing plot technique for single value in RBD and ANOVA
- Uses of vital statistics and method to obtaining it and measurements of different components of vital statistics.
- Construction, assumption and description of life table.

Syllabus:

UNIT-I

Analysis of variance for one-way and two-way classification (with one observation per cell), Linear model and its different types, Transformations, Basic concepts in design of experiments, Criteria for a good design, Uniformity trials, Size and Shape of block and plots. (12 Hours)

UNIT-II

Completely randomized and Randomized block designs, Efficiency of Randomized block design, Over Completely randomized design. (12 Hours)

UNIT-III

Latin square design, Missing plot technique, Estimation of single missing value in Randomized block and Latin square designs. (12 Hours)

UNIT-IV

Vital Statistics: Uses of vital statistics, methods of obtaining vital statistics, Measurement of mortality crude death rate, specific death rates, standardized death rates. (12 Hours)

UNIT-V

Life table, assumptions, description and construction of life table and its uses, Fertility, measurements of fertility, crude, general, specific and total fertility rates, Measurements of population growth, gross and net reproduction rates. (12 Hours)

Suggested Books and References:

1. Gupta, S.C. and Kapoor V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. Das, M. N. and Giri N.C.: Design and Analysis of Experiments.
3. Chakraborti, M.: Mathematics of Design and Analysis of Experiments.
4. Joshi, D. D.: Linear estimation & Design of Experiments.
5. Anderson R. L. and Bancroft, T.A.: Statistical Theory in Research.
6. Kempthrone, O.: Design and Analysis of Experiments.
7. Montgomery, D.C. (1991): Design and Analysis of Experiments, Wiley Eastern.

SEMESTER VI B.Sc. (Three Year Degree Program) 2025-26

Code of the Course	**: STA7102P**
Title of the Course	**: Practical Based on DSE – STA7102T**
Level of the Course	**: NHEQF Level 5.5**
Credit of the Course	**: 2**
Type of the Course	**: Discipline Specific Elective (DSE)**
Delivery type of the Course	**: Practical** (40 Hours for Hands-on software and problem solving + 20 Hours for assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The course aims to provide Practical knowledge of analysis of different designs and demography.

Course Learning Outcomes:

After hands-on MS Excel students will able to solve Sample surveys problems for:

- ANOVA for one-way classification and two-way classification.
- ANOVA of CRD, RBD and LSD.
- Estimation of missing value
- Uses of vital statistics and method to obtaining it and measurements of different components of vital statistics.
- Assumption, description and construction of life table

Syllabus:

List of Practical (hands-on with MS Excel) (60 Hours**)**

1. Analysis of variance for (i) One-way classification, (ii) Two-way classification with one observation per cell.
2. Analysis of (i) CRD (ii) RBD and (iii) LSD.
3. Estimation of single missing value In RBD and LSD
4. Vital Statistics : (i) CDR, Age specific death rates, Standardized death rates (ii) CBR, GFR, ASFR, TFR (iii) Standardized birth rate (iv) Crude rate of natural increase GRR and NRR (v) Life tables and to find out certain values with its help.

Suggested Books and References:

1. Gupta, S.C. and Kapoor V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. Das, M. N. and Giri N.C.: Design and Analysis of Experiments.
3. Chakraborti, M.: Mathematics of Design and Analysis of Experiments.
4. Joshi, D. D.: Linear estimation & Design of Experiments.
5. Anderson R. L. and Bancroft, T.A.: Statistical Theory in Research.
6. Kempthrone, O.: Design and Analysis of Experiments.
7. Montgomery, D.C. (1991): Design and Analysis of Experiments, Wiley Eastern.

SEMESTER VI B.Sc. (Three Year Degree Program) 2025-26

Code of the Course	**: STA7103T**
Title of the Course	**: Project / Dissertation**
Level of the Course	**: NHEQF Level 5.5**
Credit of the Course	**: 6**
Type of the Course	**: Discipline Specific Elective (DSE)**
Delivery type of the Course	**: Lecture** (45 Hours) and **Practical** (90 Hours) (Presentation, submission and viva-voce)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The aim of the course is to initiate students to write and present a statistical report, under the supervision of a faculty, on some area of human interest. The project work will provide hands-on training to the students to deal with data emanating from some real-life situation and propel them to dwell on some theory or relate it to some theoretical concepts.

Course Learning Outcomes:

After completing the project/ dissertation the students will learn several valuable skills and gain knowledge through writing and presenting a statistical report on a real life problem by:

- Data Collection: how to gather relevant data from various sources and ensure its reliability and validity. They will understand the importance of selecting appropriate data collection methods and techniques.

- Data Analysis: apply statistical analysis techniques to the collected data. They will gain proficiency in using statistical software or programming languages to perform descriptive and inferential statistics. They will understand how to interpret and draw meaningful conclusions from statistical results.

- Research Skills: develop essential research skills, including the ability to critically review existing literature and studies related to the chosen topic. They will learn how to synthesize

information, identify research gaps, and apply theoretical frameworks to their empirical findings.

- Theoretical Understanding: By exploring relevant theoretical concepts and frameworks, students will enhance their understanding of the subject matter. They will learn to connect empirical findings with theoretical foundations and analyze the implications of their research in a broader context.

- Report Writing: Students will learn to effectively communicate their research findings through clear and concise report writing. They will understand the structure and components of a statistical report, including the introduction, methodology, data analysis, discussion, and conclusion. They will also develop skills in organizing information, presenting data visually, and using appropriate citations.

- Presentation Skills: Through presenting their statistical report to an audience, students will enhance their presentation skills. They will learn to effectively convey complex statistical information, engage the audience, and respond to questions or feedback. They will gain confidence in public speaking and improve their ability to communicate research findings orally.

- Critical Thinking and Problem-Solving: Students will develop critical thinking skills by analyzing and interpreting data, identifying patterns, and drawing evidence-based conclusions. They will learn to identify and address potential challenges or limitations in their research process and make informed decisions to overcome them.

- Collaboration and Supervision: Students will learn to work collaboratively with their peers and seek guidance from their faculty supervisor. They will understand the importance of effective communication, teamwork, and accountability in a project-based setting.

- Application of Statistical Concepts: By working on a real-life human interest topic, students will gain practical experience in applying statistical concepts and techniques to solve real-world problems. They will understand the relevance and utility of statistical analysis in various fields and industries.

Syllabus: (135 Hours)

The project work shall be spread over the whole semester. A project may be undertaken by a group of students. However, the project report shall be submitted by each member of the group separately.

A project report shall clearly state the problem addressed, the methodology adopted, the assumptions, the hypotheses formulated, any previous reference to the study undertaken, statistical analyses performed and the broad conclusion drawn. There shall be an external examiner and an internal examiner (preferably the supervisor of the student) for the evaluation of the project work. Out of total 100 marks assigned to the project, 60 marks will be assigned on the evaluation of the project report separately by both the examiners and 40 marks will be assigned on the oral presentation and viva-voce.

Suggested Books and References:

1. Kothari, C.R. (1985): Research Methodology: Methods and Techniques, Wiley Eastern.
2. Dominowski, R.L. (1980): Research Methods, Prentice Hall Inc., New Jersey.
3. Mishra, R.P. (1980): Research Methodology, Handbook Concept Publishing Company, New Delhi.
4. IIPS (1996): Research Methodology, IIPS, Mumbai.

SEMESTER VI B.Sc. (Three Year Degree Program) 2025-26

Code of the Course	**: SES7366P**
Title of the Course	**: Data Analysis Using SPSS**
Level of the Course	**: NHEQF Level 5.5**
Credit of the Course	**: 2**
Type of the Course	**: Skill Enhancement Course (SEC)**
Delivery type of the Course	**: Practical** (40 Hours for Hands-on software and problem solving + 20 Hours for assessment)

Prerequisites:

Mathematics courses of Central Board of Secondary Education or equivalent at Sr. Sec. level.

Objectives of the Course:

The objective of the course "Data Analysis using SPSS" is to equip participants with the knowledge and skills necessary to effectively analyze and interpret data using the Statistical Package for the Social Sciences (SPSS) software. Throughout the course, participants will learn how to navigate the SPSS interface, import and clean data, conduct various statistical analyses, and generate meaningful insights from their data.

Course Learning Outcomes:

After completion of course using SPSS in data analysis students will learn:

- Understand the fundamental concepts and principles of data analysis.
- Familiarize with the SPSS interface and its key features.
- Import data from various sources into SPSS and perform data cleaning and preparation asks.
- Explore and visualize data using descriptive statistics, charts, and graphs.
- Apply statistical techniques, including hypothesis testing, correlation analysis, regression analysis, and analysis of variance (ANOVA) and interpret the results of statistical analyses and draw meaningful conclusions.

Syllabus:

Note: Students will be required to do practical, based on topics listed below, using Excel & SPSS:

List of Practical: (60 Hours)

1. Presentation of raw data
2. Graphical representation by (i) Histogram (ii) Frequency polygon (iii) Frequency curve and (iv) Ogives.
3. Diagrammatic representation by (i) Bars (ii) Pie diagram.
4. Graphical plots: Box-Whisker plots, Histograms and Population Pyramids.
5. Measures of Central Tendency: Mean Median, Mode, G.M., H.M., Quartiles, and Deciles & Percentiles.
6. Measures of Dispersion (i) Range (ii) Semi inter quartile range (iii) Mean Deviation (iv) Standard Deviation and Variance (v) Coefficient of Variation (vi) Lorenz Curve.
7. Moments and various measures of Skewness and Kurtosis.
8. Fitting of curves: (i) Straight line (ii) Parabola (iii) Exponential and Power curves.
9. Computation of simple, multiple, partial and rank correlation coefficients.
10. Computation of simple regression and test for intercept and slope.
11. Calculation of correlation coefficient by (i) Karl Pearson's method and (ii) Spearman's rank method.
12. Construction of regression line.
13. Preparation of bivariate frequency distribution, calculation of correlation coefficient and construction of regression lines.
14. Calculation of Multiple and Partial correlation coefficients and construction of multiple regression equations (for three variables only).
15. Correlation analysis, Regression analysis, Testing of hypothesis and ANOVA.

Suggested Books and References:

1. Darren George, Paul Mallery: SPSS for Windows Steps by Step, A simple guide and Reference.